CONTENTS

FIGURES

Annex I	**-**	Example copies of the training schedules for weeks commencing 20 and 27 February and 5 and 12 March 2012
Annex J	**-**	Acromas Shipping Ship Familiarisation Certificate for the first cook
Annex K	**-**	MAIB's Safety Study 1/2001 – Review of Lifeboat and Launching Systems – Section 2.2 – Bowsing and Tricing
Annex L	**-**	Manufacturer's Training and Operating Instructions for Lifeboat Davits – To Launch for Lifeboat Operations
Annex M	**-**	mv *Saga Sapphire* - LSA Training Manual and Survival Techniques – Chapter 7 Protection in Launching Areas – new Section 7.4 - Use of Safety Harnesses When Preparing Lifeboats

GLOSSARY OF ABBREVIATIONS, ACRONYMS AND TERMS

AB	-	able seaman
ABP	-	Associated British Ports
BBS	-	band-bowsing system
BV	-	Besloten Vennootschap
COSWP	-	Code of Safe Working Practices for Merchant Seamen
DPA	-	Designated Person Ashore
FSI	-	Flag State Inspection
GL	-	Germanischer Lloyd
GmbH	-	Gesellschaft mit beschränkter Haftung
GRP	-	Glass reinforced plastic
IMO	-	International Maritime Organization
ISM Code	-	International management code for the safe operation of ships and for pollution prevention (International Safety Management (ISM) Code adopted November 1993)
kg	-	kilogram
kN	-	kilonewton
Ltd	-	Limited
m	-	metre
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MIN	-	Marine Information Note
mm	-	millimetre
MSN	-	Merchant Shipping Notice
mv	-	motor vessel
OOW	-	Officer of the Watch
PSC	-	Port State Control
PSSC	-	Passenger Ship Safety Certificate
SMC	-	Safety Management Certificate
SMS	-	Safety Management System
SO	-	Safety Officer

SOLAS	-	International Convention for the Safety of Life at Sea, 1974 and its Protocol of 1988
STCW	-	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended in 1995 and 1997 (STCW Convention)
STO	-	Safety Training Officer
SWL	-	safe working load
t	-	tonne
VHF	-	very high frequency
VTS	-	Vessel Traffic Services

TERMS

Besloten Vennootschap - Dutch legal term associated with company liability and the equivalent to the English “Limited”.

Fall - wire/natural/man-made rope which is used to lower and hoist boats. The fall is connected to the lifeboat release hook arrangement and to the davit winch drum, and passes through the davit head.

Gesellschaft mit beschränkter Haftung - German legal term associated with company liability and the equivalent to the English “Limited”.

Gyn-tackle - a system of pulleys consisting of a two-fold and a three-fold block, the standing end of the rope being attached to the three-fold block.

Gripe - wire, rope or canvas lashing used to secure a boat while housed in its davits to prevent movement, which may result in damage to the boat while the vessel is underway.

Skate - removable steel rail that is fixed to the hull of a lifeboat, to enable it to override projections on the side of a listed ship when it is launched.

Soul counter - a person who receives and accounts for passengers as they arrive at their lifeboat stations, ensures they are correctly dressed and controlled and, when ordered, assists them to embark their lifeboats/tenders.

Times: All time in this report are UTC+1 unless otherwise stated

Saga Sapphire

SYNOPSIS

At 1020 on 29 March 2012, two crewmen fell 22m into the water from *Saga Sapphire*'s No 5 lifeboat while the ship was secured port side alongside in Southampton. They sustained minor injuries.

At 1000, as part of an expanded Port State Control inspection, a drill had been initiated and the starboard side lifeboats were lowered and held alongside deck 9 by their tricing pennants. No 5 lifeboat's bowsing tackles were rigged, tensioned from the coach roof and secured to bitts welded to the bowsing tackle blocks fitted to the lifeboat lifting plates. On the order to release the tricing pennants, the forward crewman, who was a first cook, was unable to remove the drop-nosed pin securing the tricing pennant hook release lever in the closed position.

The overseeing fourth officer went to assist. As he removed the pin and operated the release lever, the first cook stepped to one side and the forward bowsing rope came free from the bitts. Without tension on the bowsing tackle, the lifeboat swung violently away from the ship's side and heeled to port. The fourth officer and first cook, who were not wearing any form of personal restraint, slipped from the smooth coach roof and fell into the water. They were quickly recovered by other members of the crew.

As the vessel emerged from a delayed refit on 16 March, it was found that the bowsing tackle ropes were too large to be held on the bitts, but no action was taken to replace them. The first cook had not received any training for his specific role and none of the lifeboat preparation party or crew wore a safety harness and tether; those harnesses that were on board were life expired. As the ship's management team assisted with the refit project work, training oversight was inadequate, no one took responsibility for lifeboat training and the ship's safety management organisation was improperly prepared for its operational role.

The Acromas Group has initiated a review of the refit project management and consequences of the refit completion delays. In addition, some changes have been made to the lifeboat-related documentation, equipment and procedures.

Recommendations have been made to Acromas Shipping Ltd to ensure its proposed changes to the operation of its lifeboats are formally approved; operating instructions for bowsing and tricing equipment across its fleet are consistent and accord with best practice; and that arrangements are put in place to ensure that future refit plans accommodate the need to fully establish the ship's Safety Management Organisation and complete crew training before the vessel enters service.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF MV *SAGA SAPPHIRE* AND ACCIDENT

SHIP PARTICULARS

Vessel's name	*Saga Sapphire*
Flag	Malta
Built	1981 – Bremen, Germany
IMO number	7822457
Type	Passenger ship
Classification society	Germanischer Lloyd
Manager	Acromas Shipping Ltd
Construction	Steel
Length overall	199.63m
Length between perpendiculars	175.18m
Breadth (moulded)	28.5m
Draught	8.421m
Gross tonnage	37049
Displacement	26512t
Minimum safe manning	21

VOYAGE PARTICULARS

Port of departure	Palermo, Sicily
Port of arrival	Southampton, United Kingdom
Type of voyage	International
Cargo information	Not applicable

MARINE CASUALTY INFORMATION

Date and time	29 March 2012 at 1020
Type of marine casualty or incident	Less Serious Marine Casualty
Location of incident	50º 54.14'N 001º.42'W at 106 berth, ABP Southampton
Place on board	No 5 lifeboat
Injuries/fatalities	1 deck officer - rope burns to hands, penetrating wound and dislocation of two toes of the right foot 1 crewman - rope burns to hands
Damage/environmental impact	None
Ship operation	Alongside undertaking emergency drills
Voyage segment	Arrival
External environment	Sheltered waters, north-westerly F2, good visibility with an air temperature of 16ºC.

1.2 BACKGROUND

1.2.1 Company organisation

Acromas Group is the parent holding company of a number of large UK financial and holiday companies. Acromas Holidays Limited (Ltd) is part of the Group and is the parent company of Acromas Shipping Ltd (Acromas), which, at the time of the accident, owned and managed four cruise ships. The company also occasionally chartered out the ships for specialist interest group cruises.

Each vessel was held in a "single ship" daughter company that was wholly owned by Acromas Shipping Ltd. *Saga Sapphire* was owned by Saga Cruise BDF Ltd and operated by Acromas Shipping Limited. Cruises advertised under the "Saga" brand are aimed at the UK market for persons over 50 years of age.

1.2.2 Vessel management and pre-accident key dates

On 2 November 2011, *Bleu de France* entered refit at Fincantieri's shipyard at Palermo in Sicily and, on 1 February 2012, was renamed *Saga Sapphire*. At the same time, the ship's management company changed from the Spanish-based Pullmantur Cruise Ship Management Ltd, which had been managing the vessel since 4 May 2004, to Acromas Shipping Ltd.

The vessel had sailed under the Maltese flag since April 2004 and had been classed with Germanischer Lloyd (GL) since 28 January 2006.

The planned refit completion date was 17 February 2012. However, industrial action by dockyard workers and fuel tanker drivers, as well as emergent lifeboat defect rectification work, delayed *Saga Sapphire*'s handover to Acromas Shipping Ltd until 16 March. She finally departed Palermo, as the Saga fleet's flagship, on 19 March under a Short-Term Passenger Ship Safety Certificate (PSSC) valid until 29 March 2012. The late departure resulted in the loss of a non-revenue shakedown cruise from Monaco and the delay of the first revenue-generating cruise, planned to depart from Southampton on 26 March, until 3 April 2012.

1.3 USE OF "LIFEBOAT" TERMINOLOGY

The term "lifeboat(s)" is used collectively in this report to include tenders, open lifeboats and rescue boats. The individual equipment descriptors are used to add clarity where appropriate.

1.4 NARRATIVE

1.4.1 Passage from Palermo and arrival at Southampton

During the passage from Palermo to Southampton, the company's Safety Training Officer (STO) conducted a variety of company-required crew familiarisation and mandatory STCW Convention training each day. This included, *inter alia*, watertight door operation, breathing apparatus re-charging procedures, and manual handling techniques. The programme did not include any lifeboat-related training other than the generic information contained in the familiarisation training modules.

At 0737 on 26 March 2012, *Saga Sapphire* berthed, port side to No 106 berth, at Associated British Ports (ABP) Southampton.

During the morning of 28 March, surveyors from the Maritime and Coastguard Agency's (MCA) Southampton Marine Office began an expanded Port State Control inspection[1]. At 1930, an exercise, which culminated in an abandon ship drill, was carried out under the control of the ship's officers. The master had nominated the fourth officer to assist with, and to oversee, the lifeboat preparations. However, not all the lifeboat preparation team members arrived at their muster stations because some of the ship's main broadcast speakers were not functional and they did not hear the instructions.

As the ship was secured port side to, only the starboard side lifeboats were used in the drill. While it is unclear how many of the lifeboats were lowered to deck level, it is known that none of the skates or bowsing tackles was rigged and none of the lifeboats were lowered into the water.

On completion of the drill, the master broadcast an overview debrief to the crew. He also informed them that a similar drill would be conducted the following morning by the MCA as part of the expanded PSC inspection.

1.4.2 Events leading up to the man overboard

Just before 1000 on 29 March, two MCA surveyors positioned themselves on the bridge to assess the bridge team's reaction and management of the planned emergency drill. Other surveyors were in the vicinity of the fire lockers and the hotel director's office on deck 7, which was the locus for the fire drill. At 1000, the lead MCA surveyor arranged for a "Code Bravo" to be broadcast, which was the ship's code for a fire.

At 1003, the ship's Rapid Response Team mustered at the main stairs in readiness to make an assessment of the scene of the fire. They were under the direction of the ship's Safety Officer, who was also the On Scene Commander. In the meantime, Alpha, Bravo, Charlie, Delta and Echo fire teams mustered at their respective fire stations. They dressed in fire-fighting equipment in preparation to be deployed to the scene of the fire by the master, who was the Operational Command. Very soon afterwards, the master instructed the staff captain to transmit an exercise "Mayday" message.

In the meantime, the crew were sent to crew alert stations and the master instructed the fourth officer to proceed to the starboard side of deck 9 **(Figure 1)** to oversee the lifeboat preparations. As the lifeboat preparation teams and "soul counters" arrived, the bosun lowered the two tenders and three lifeboats, which were automatically held at deck level by their respective tricing pennants **(Figure 2)**. The two-man lifeboat and tender preparation crews then started to rig their respective fore and aft bowsing tackles. This was done under the instructions of the bosun and fourth officer, in readiness to release the tricing pennants, embark the simulated passengers, lower the boats to the water, and release the "on-load" hook to enable the boats to proceed away from the ship under their own power.

[1] The inspection was conducted in accordance with the criteria set out in the International Maritime Organization's "Paris Memorandum of Understanding on Port State Control".

Figure 1: Starboard boat deck

Figure 2: Lifeboats held at deck level by tricing pennants

To access the bowsing tackle connection points, the lifeboat preparation crews had to stand on top of the tenders' coach roofs **(Figure 3)** and on the top of the open lifeboats' stem and stern compartments **(Figure 4)**. While the crews wore safety helmets, safety shoes and solid lifejackets, none of them wore a safety harness and tether.

As the lifeboat preparations continued, the fire teams attempted to access the vicinity of the fire. Despite warnings, other crew members continually breached the smoke boundary and the lead MCA surveyor advised the master that he intended to abort the drill. However, the master requested that the drill be continued to help improve training and to identify other potential learning points. The lead surveyor agreed, and at 1015, the master broadcast the areas that the crew were to avoid.

At 1016, all lifeboat and liferaft preparation team radio checks with the bridge were completed.

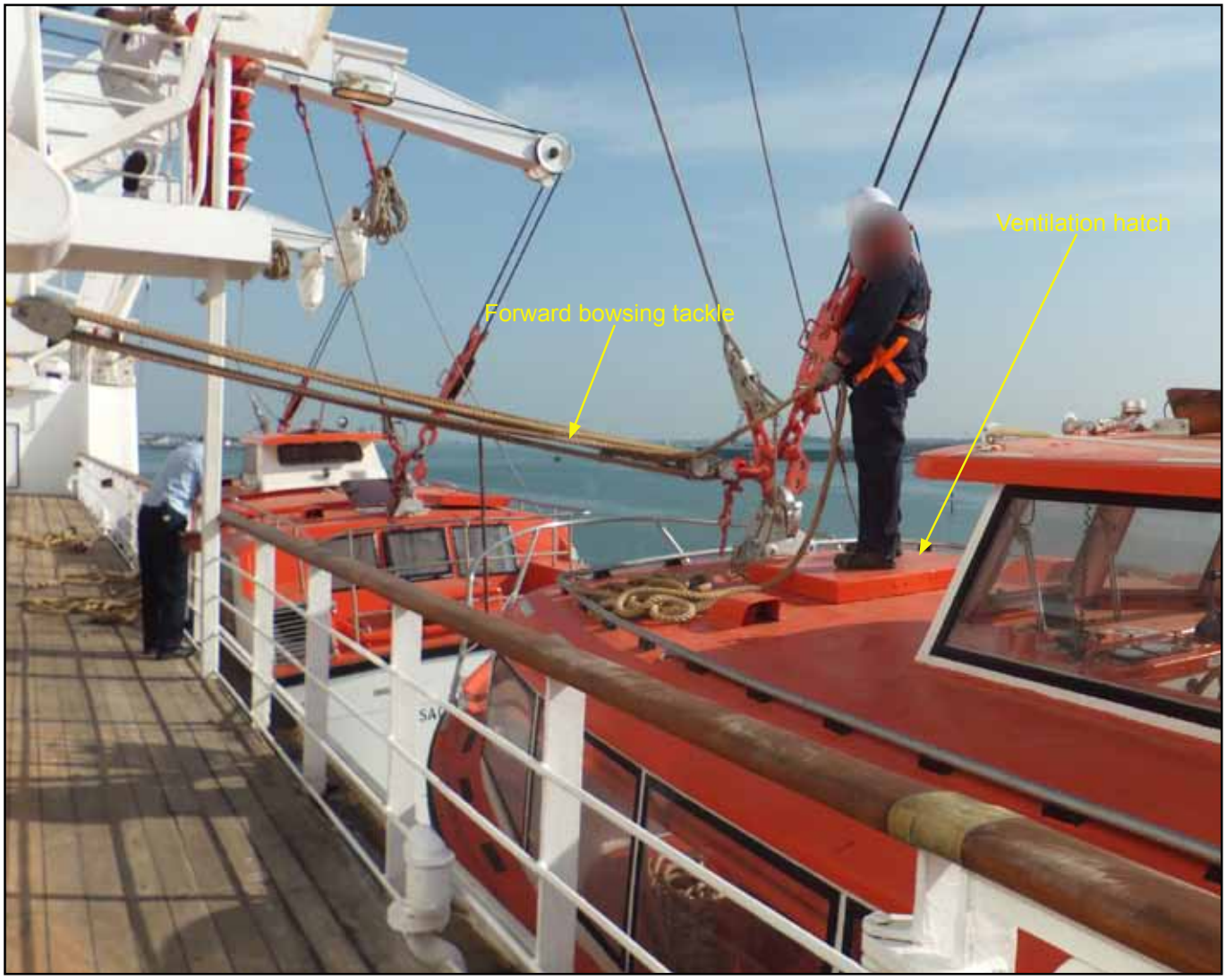

Figure 3: Access to bowsing tackles from the tender's coach roof

Figure 4: Open lifeboat - access to bowsing tackles

1.4.3 Man overboard

By about 1017, the fourth officer had satisfied himself that all the bowsing tackles had been rigged, tensioned and the ropes secured on the bitts **(Figure 5)**. Shortly afterwards, he instructed the lifeboat crews to release their tricing pennants.

The bosun then hoisted No 5 tender sufficiently to take the weight off the tricing pennants and so ease the release of their hooks. The able seamen (ABs) who were the after crewmen of Nos 3 and 5 tenders noticed that the first cook, who was the forward crewman of No 5 tender, was in difficulty. He was unable to remove the drop-nosed pin securing the tricing pennant release lever, from the block cheek plate **(Figure 6)** while holding onto the bowsing tackle's rope tail. Both ABs offered him advice. As the after AB of No 5 tender prepared to go forward to assist him, the fourth officer also noticed the problem and instructed the after AB to remain at his position.

At about 1019, the fourth officer stepped onto No 5 tender and moved onto the coach roof to help the first cook. He was wearing an auto-inflate lifejacket but no safety harness and tether.

As the fourth officer removed the drop-nosed pin and pushed up the tricing pennant hook release lever, the bowsing tackle rope slipped from the bitts on the block **(Figure 7)**. As the tension was released on the forward bowsing tackle, the tender's bow swung outboard under the influence of the now vertical forward fall. At the same time, the tender's port side dipped down and both the fourth officer and the first cook began to slide off the tender's coach roof. With no safety harness and tether to constrain them, the fourth officer held onto the small tail rope connected to the tricing pennant hook release lever and the first cook held onto the bowsing tackle rope.

The fourth officer's and first cook's attempts to prevent themselves from falling over the tender's port side were unsuccessful. The fourth officer fell first and made contact with the balcony rail of cabin 8036 **(Figure 8)**, one deck below the tender's position. His safety helmet and right safety shoe landed on the balcony deck and he then fell about 22m into the water. As his lifejacket auto-inflated, the fourth officer surfaced just as the first cook entered the water. As the latter surfaced, the fourth officer swam towards him to check his condition and to provide reassurance that they would be rescued. At the same time, a lifejacket and two lifebuoys were thrown into the water and each man managed to grasp one of the lifebuoys.

1.4.4 Recovery of man overboard

The bosun, who was on the winch deck above the boat deck, witnessed the sequence of events. He immediately alerted the officer of the watch (OOW) to the "man overboard" emergency on his very high frequency (VHF) radio and repeated the alert several times.

The master heard the transmission and, at 1020, he instructed the staff captain to announce that the MCA's emergency drill was cancelled and to broadcast a "Code Oscar" (the ship's code for a man overboard emergency). One of the two second officers on board, who was also the navigator and a designated lifeboat commander,

Figure 5: Bowsing tackles secured to bitts

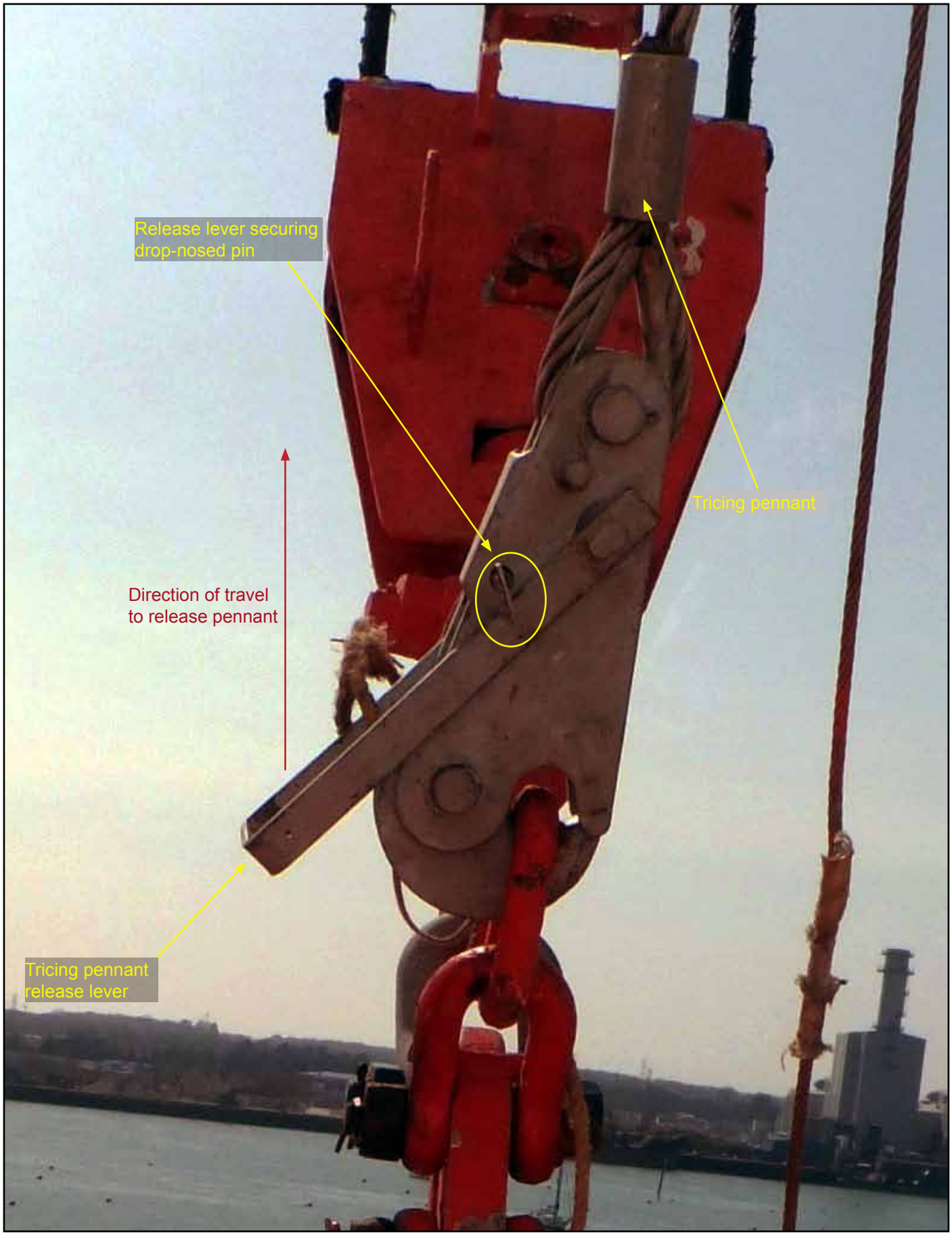

Figure 6: Tricing pennant release lever and securing drop-nosed pin

Figure 7: Bowsing tackle rope on the block bitts

Figure 8: Balcony rail of cabin 8036

ran to deck 9 from deck 6, where he was involved in the fire drill. The second officer, ship's Safety Officer (SO) and four ABs embarked No 5 tender in readiness to recover the two men in the water.

In the meantime, the master instructed the OOW to alert ABP Southampton's Vessel Traffic Services (VTS) of the emergency on VHF radio channel 12 and to request an ambulance. He then went onto the starboard bridge wing and, using a megaphone, checked on the condition of the men in the water. The fourth officer indicated that neither he nor the first cook was in any immediate danger.

As the bosun lowered No 5 tender to the water, the master maintained contact with the men in the water and the OOW updated VTS on the developing situation. At 1023, the second officer manoeuvred the tender alongside the men in the water. By 1025, they were both recovered into the tender using its manoverboard recovery ladder. The master instructed the second officer to take the tender alongside deck 4's fresh water and bunker station, which was accessible through a shell plating door. By 1030, the casualties were transferred by pilot ladder into the care of the ship's doctor and medical team.

At 1045, the two men were transferred to Southampton General Hospital by ambulance for assessment and treatment. Fortunately, they were both able to be released during the early evening.

The first cook had suffered rope burns to both of his hands. The fourth officer also suffered rope burns to his hands, as well as a penetrating wound to his right foot and dislocation of two toes.

1.4.5 Post-accident events

Inspectors from the MAIB attended soon after the accident. During the course of the investigation, an accident re-enactment was conducted which was preceded by a task-specific risk assessment, as required by the inspectors. The MCA continued the expanded PSC inspection between 30 March and 2 April, during which time all the lifeboats and tenders were fitted with their respective skates; the bowsing tackle ropes had been changed and replacement blocks ordered. On 2 April, a further set of drills, culminating in abandonment of the ship, was carried out to the satisfaction of the MCA.

GL issued the vessel with an interim PSSC, valid for 6 months, and the vessel sailed from Southampton on her inaugural voyage at 1726 on 3 April 2012.

1.5 ENVIRONMENTAL CONDITIONS

On 29 March 2012, it was 50% spring tide and, at the time of the accident, the tide was flooding. Low water was at 0850 and high water at 1534. The wind was north-westerly, force 2. The visibility was good and the air and sea temperatures were 16ºC and 10ºC respectively.

1.6 CASUALTIES

1.6.1 Fourth officer

The 27 year-old, British fourth officer qualified as a deck officer on 25 November 2011. Among other STCW-related qualifications, he was awarded a Proficiency in Survival Craft and Rescue Boats certificate on 29 October 2011. Since joining *Saga Sapphire* on 2 February 2012, he had been mainly engaged in lifeboat maintenance duties. At the time of the accident, he was recorded on the crew list as a supernumerary; soon after the accident, he was signed on as the ship's fourth officer.

1.6.2 First cook

The 43 year-old, Filipino first cook joined *Saga Sapphire* on 2 March 2012. This was his first ship since completing his Basic Safety, Crowd Management, Personal Survival and First Aid training in Manila, Philippines on 14 February 2012. He was awarded his Ship Familiarisation Certificate on 9 March 2012. He had also completed the Saga Safety at Work and Manual Handling Courses on board the ship.

1.7 REFIT-RELATED ASPECTS

1.7.1 Vessel structural changes and their implications for passengers and crew

On the purchase of *Bleu de France,* Acromas Shipping Ltd made a commercial decision to fully refurbish the public rooms, modify the passengers' accommodation and amend manning levels to suit its business model criterion of single-sitting dining. The strategy included the planned reduction in passenger berths from 1048 to 706 against a maximum of 730 permitted by the Passenger Ship Safety Certificate (PSSC). To improve the passenger to crew ratio, it was also planned to increase crew levels, from 366 to 428, well within the maximum of 470 allowed. The planned changes resulted in a total of 1134 persons on board against a maximum permissible of 1200 persons.

To compensate for the calculated increase in the ship's lightship condition following the structural changes, a number of heavy items were removed from the ship. These included cranes, cargo hatch, the swimming pool magnadome and the after passenger swimming pool. Because of the reduction in passenger levels, Nos 1 and 2 open lifeboats were no longer required and so were also removed to reduce the total weight of the ship.

It was later discovered that the remaining 10 lifeboats, tenders and rescue boats were overweight. This resulted in a further, unintended, reduction in passenger and crew levels. Because of the lifeboat issues, GL issued the ship with its Record of Equipment for the Interim PSSC (Form P), instead of a full PSSC, on 30 March 2012, which was valid until 29 August 2012. The document certified that a maximum of 1010 persons could be carried on board, of whom 600 could be passengers and the remaining 410 crew. This represented an 18% reduction on potential passenger berth sales against the planned passenger profile.

1.7.2 Impact of project management

Acromas Shipping Ltd undertook the project management of *Saga Pearl II*'s refit, which completed in March 2010. However, this had resulted in a reduction in the effective oversight of the operational vessels in the Saga fleet. Consequently, it was decided to sub-contract some oversight of *Saga Sapphire*'s refit to specialist refit project management staff.

The five-man refit project team comprised three external contractors, one of whom was the refit project manager, and two Acromas Shipping Ltd employees. There was a total of three different project managers employed during the refit contract. This affected continuity and required the master, ship's senior officers and Acromas Shipping Ltd senior managers, including the Technical Director, Commercial Director and the Chief Executive, to take on an increasing, on-site, project management responsibility. This was especially so towards the end of refit when it became apparent that the refit completion date was unachievable. It was clear that additional management effort was required to try to reduce slippage within the programme and preserve the income-generating cruise schedule.

1.8 LIFE-SAVING APPLIANCES - REGULATION AND GUIDANCE

1.8.1 Company regulation compliance and policy for using MCA guidance

As a Malta-registered vessel, *Saga Sapphire* was subject to the requirements of the Malta Merchant Shipping Act 1973 and the administration's Merchant Shipping Notices (MSN), which were established in 1993. There were no lifeboat related Malta MSNs.

It was a policy of Acromas to refer to a number of the MCA's publications as examples of industry best practice and advice. These included the Code of Safe Working Practices for Merchant Seamen (COSWP), MSNs, Marine Guidance Notes (MGN) and Marine Information Notes (MIN). Many of the ship's officers were familiar with these publications and, by referring to them in the Safety Management System (SMS), the company was endorsing their use, even though compliance with the documents was not required by the Malta administration.

1.8.2 International regulations and guidance

The international regulations concerning life-saving appliances and arrangements are contained in the International Convention for the Safety of Life at Sea 1974, as amended (SOLAS). The International Maritime Organization's (IMO) publication - "Life-Saving Appliances, including LSA Code, 2010 Edition", known as The LSA Code, specifies mandatory international standards for life-saving appliances, as required by Chapter III of SOLAS.

IMO's Maritime Safety Committee Circular, MSC.1/Circ.1206/Revision 1 - Measures to Prevent Accidents with Lifeboats - dated 11 June 2009 identifies the unacceptably high number of accidents with lifeboats in which crew were injured, sometimes fatally, while participating in lifeboat drills and/or inspections. The Circular provides wide-ranging guidance on servicing and maintenance, the importance of training and the conduct of drills. The main text of the Circular and Annex 2 - Guidelines on Safety During Abandon Ship Drills Using Lifeboats - are particularly relevant and are at **Annex A**.

1.8.3 United Kingdom instructions

The COSWP is carried on board all Saga fleet vessels. In this case, Sections – 10.2 – 10.4.9 of Chapter 10 – *Emergency Procedures* are relevant as they include advice on musters and the conduct of lifeboat-related drills. A copy of the sections of the reference is at **Annex B**.

MSN 1676(M) – The Merchant Shipping (Life-Saving Appliances for Ships Other Than Ships of Classes III to VI(A)) Regulations 1999 complement the SOLAS requirements.

MSN 1803(M) – LIFEBOATS – Measures to Prevent Accidents transposes the IMO's 26 May 2006, Maritime Safety Committee Circular MSC.1/Circ.1206/Revision 1 – Measures to Prevent Accidents with Lifeboats.

MCA's Instructions to Surveyors - MSIS 14 – Survey of Life-Saving Appliances: Volume I provides comprehensive technical information on all aspects of lifeboats. It is the only document identified by MAIB that specifies bowsing tackle requirements. A copy of Section 18.3.5 – *Bowsing and Tricing Arrangements* and Appendix 0 and Annex 1 – *Cordage for Lifesaving Appliances* is at **Annex C**.

1.8.4 Company instructions

The company STO produced the mv *Saga Sapphire* LSA Training Manual and Survival Techniques publication which was available to the ship's officers and crew. Chapter 8 provided guidance on lifeboat matters. A copy of Sections 8.2 – *Lifeboat Davits* and 8.3 – *Launching the Lifeboats* is at **Annex D**.

1.9 TENDERS, OPEN LIFEBOATS, AND RESCUE BOATS

1.9.1 Responsibility

The ship's SO was responsible to the master for the maintenance of all life-saving appliances, including those relating to the tenders, open lifeboats and rescue boats. To assist in this role, the two second officers were responsible for routine checks and for making the SO aware of defects so that these could be rectified as soon as possible and that any spares required were promptly ordered. While the 8-12 watchkeeping second officer was the nominated Boats Officer, during the refit the master nominated the fourth officer, who at the time was a supernumerary officer, to assist with lifeboat work.

1.9.2 General description

Saga Sapphire was equipped with four, 11.5m enclosed tenders/lifeboats[2] **(Figure 9)**, designated Nos 3, 4, 5 and 6 lifeboats[3]. Nos 4, 5 and 6 lifeboats were built by Robert Hatecke GmbH based in Drochtersen, Germany. Although of the same dimensions as the other tenders, No 3 tender was built by Fritz Fassmer GmbH, also of Germany, but to a Robert Hatecke GmbH design. However, it was of a slightly different construction and was heavier than the others. In addition to their life-saving

[2] On 8 June 2012, Nos 3 and 4 tenders were replaced with two Type PEL 9.7, 150 persons (but currently certified for 130 persons), partially enclosed lifeboats manufactured by Ernst Hatecke GmbH of Germany.

[3] Nos 1 and 2 lifeboats were removed during the refit but it was decided to retain the original identification numbering for the remaining 10 boats.

Figure 9: Tender/lifeboat

role, the tenders were also designated for passenger transfer use. The four tenders were fitted with fore and aft ventilation hatches to the coach roofs. The hatches were positioned adjacent to the “on-load” release hooks.

Saga Sapphire also carried four, 11.5m open lifeboats, designated Nos 7, 8, 9 and 10 lifeboats **(Figure 4)** and two, 8.6m rescue boats, designated Nos 11 and 12 lifeboats. The open lifeboats were built by Robert Hatecke GmbH and the rescue boats by Fritz Fassmer GmbH.

The tenders and rescue boats were driven by twin and single Deutz SF6L912 engines respectively, and the open lifeboats by a single Deutz KHD engine. All the boats were fitted with a "Fassmer", duplex on-load release system to detach the boat from the falls. The tenders and open lifeboats were also fitted with a hydrostatic interlock, which prevented the coxswain from operating the release until the boat was fully waterborne.

1.9.3 Non-skid surfaces

Both Section 4.4.3.5 of The LSA Code and Section 3.10 of MSN 1676(M) state:

“All surfaces on which persons might walk shall have a non-skid finish”.

Despite the need to access the tender coach roofs and the open lifeboat stem and stern compartment roofs, none of the lifeboats’ surfaces was finished with any form of non-skid surface to improve traction.

1.9.4 Lowering and hoisting arrangements

The bowsing tackle and davit arrangements were designed in 1970 and 1980 respectively by the Davit-Company B.V[4], based in Utrecht in the Netherlands. All the lifeboats were held in single pivot sets of davits above deck 9 and were secured in their housed positions using standard, adjustable wire gripes fitted with bottle screws and Senhouse slips. They were also fitted with steel wire maintenance strops.

The davit winch control positions for the lifeboats were on deck 10, the winch deck. Each position was equipped with a lifeboat launching operation instruction poster. The lifeboats could be lowered under power or under gravity using a “dead man”, counter-balance centrifugal brake control lever fitted to the end of the brake disc shaft. Both the power and gravity controls were duplicated on an extension sponson situated above each boat. The davit winch controls are shown at **Figures 10** and **11**.

1.9.5 Operating procedure

In accordance with the ship’s muster emergency plan, the port and starboard lifeboat preparation teams were under the direction of the assistant bosun and the bosun respectively. Each was nominated as a “lifeboat preparation leader”. Before a lifeboat was lowered, the steel wire gripes were removed and checks made that no other lashings were in place. The boat was then lowered under gravity. As the boat approached deck 9 level, it was automatically brought into the ship’s side by the tricing pennants and lowering was then stopped.

[4] In 1995, the Davit-Company B.V. merged with Schat-Harding to become Schat-Harding B.V.

Figure 10: Davit control position on the winch deck

Figure 11: Davit controls on the winch deck extension sponson

The lifeboat crew/preparation teams then climbed onto, as appropriate, the tenders coach roof or, in the case of the open lifeboats, the stem and stern compartment roofs, and fitted bowsing tackles to secure the boat alongside deck 9. After the painter was connected and hull drain plugs confirmed to be fitted, the lifeboat preparation leaders instructed the fore and aft bowsing tackles be fitted. Once the bowsing tackles were tensioned and secured, the tricing pennants were released[5]. The boat was then considered ready to embark passengers, who boarded through the embarkation gates fitted to the guardrails of deck 9.

Once all passengers and crew were confirmed on board, the bowsing tackles were released slowly to prevent the lifeboat from swinging against the ship's hull. Once fully released, the boat was suspended vertically from the davit falls. The lifeboat could then be lowered to the water and the engine started. Once the lifeboat was fully waterborne, the "on load" release hook hydrostatic interlock would close and the coxswain could then release the hooks using the release lever adjacent to his control position. After the painter was released, the coxswain was able to steer the boat away from the ship.

Schematics illustrating the operation are at **Figures 12** and **13**.

1.10 MUSTER/EMERGENCY PLAN LIFEBOAT-RELATED RESPONSIBILITIES

1.10.1 General

The muster/emergency plan laid out individual responsibilities, in the form of an Instruction No, for those involved in lifeboat operations. These were: lifeboat preparation leader (the bosun and assistant bosun); lifeboat preparation deck (12 deck ABs); lifeboat preparation (18 hotel staff); and, lifeboat crew (18 hotel staff).

1.10.2 Responsibilities as laid out in the muster/emergency plan

Instruction No 7 - lifeboat preparation leader – stated:

> *"Take charge of the preparation of all lifeboats, including removal of gripes, lowering boat to embarkation, preparing embarkation ladders. Ensure each boat is manned with appropriate crew. Report to Operational Command when all boats are at embarkation level. Standby to lower each boat when ordered".*

Instruction No 8 - lifeboat preparation deck – stated:

> *"Muster on your allocated side of the Boat Deck and report to the Bosun/ Second Bosun. Follow their orders to un-rig lifeboats and lower each boat to embarkation. Once at embarkation proceed to your allocated lifeboat and continue preparing it for operation."*

Instruction No 9 - lifeboat preparation – stated:

> *"If ordered prepare and rig lifeboat boarding ladder. Once lifeboats are lowered to embarkation level, assist boat crew with preparing lifeboat for launching. Assist Boat Crew with rigging bowsing tackles. Attach boat painter line to ship.*

[5] During drills, the falls were tensioned to take the weight of the lifeboat before the tricing pennants were released. This procedure reduced the risk of shock loading the falls.

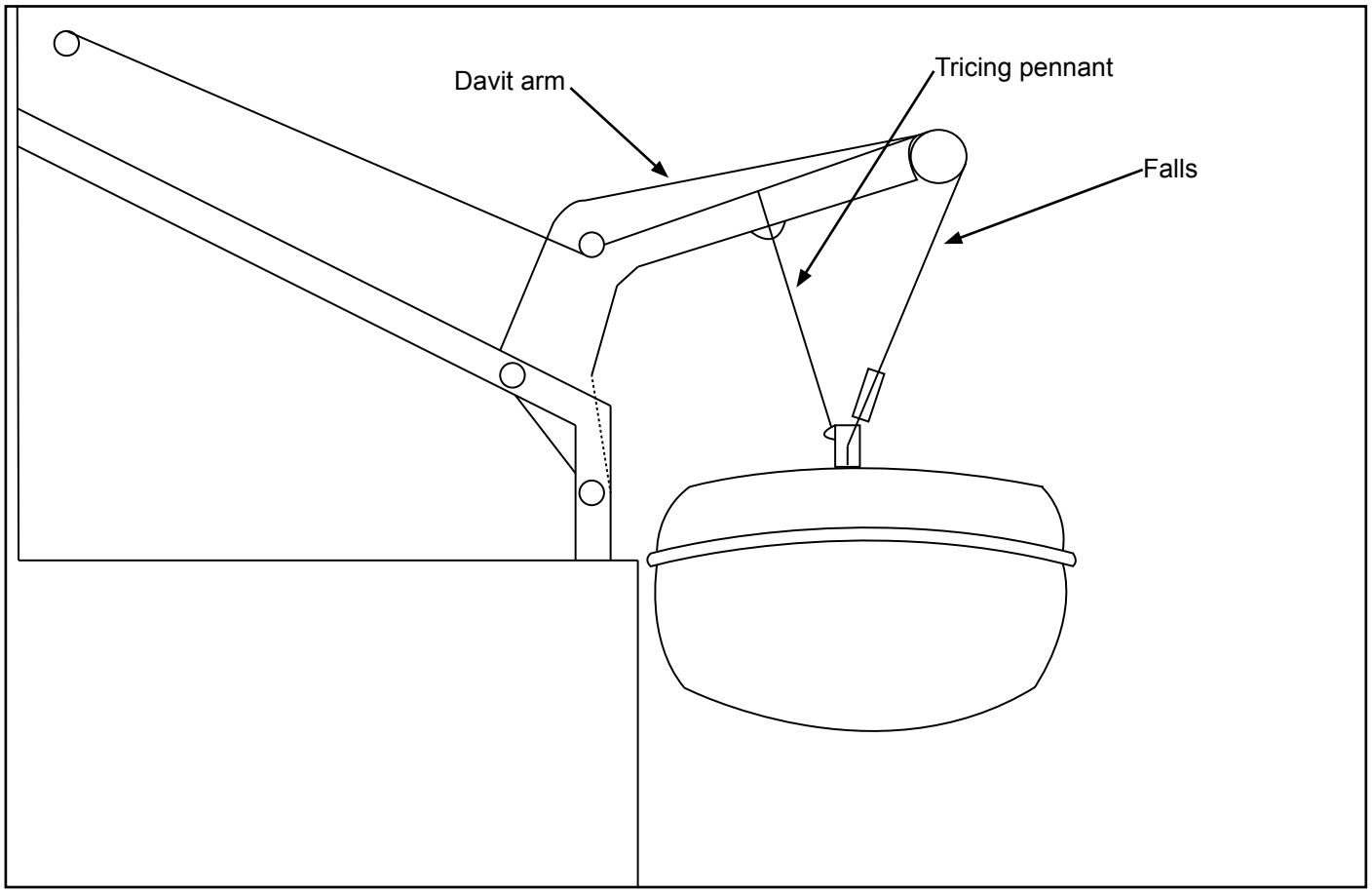

Figure 12: Schematic showing lifeboat held against the deck by action of the tricing pennant

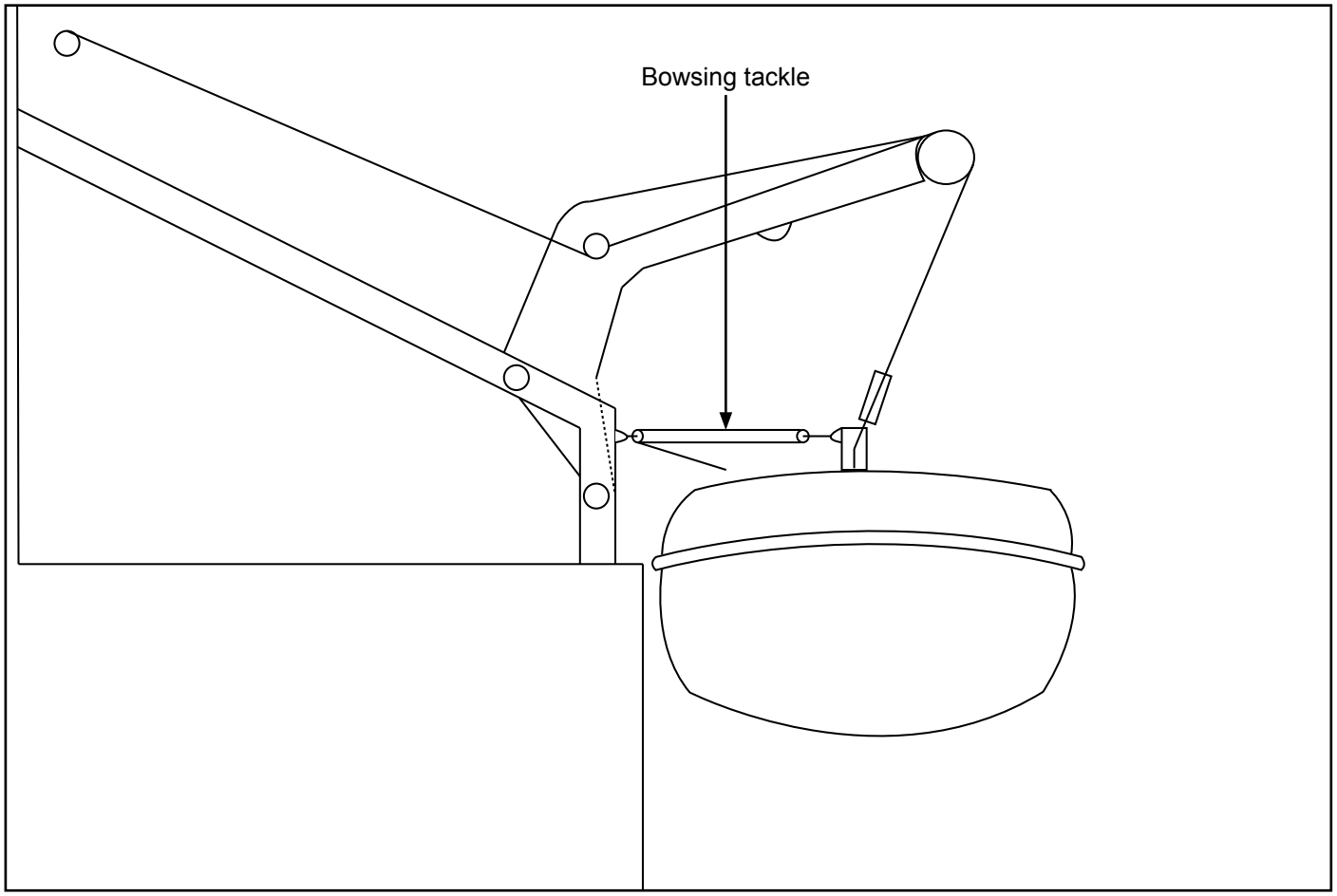

Figure 13: Schematic showing lifeboat bowsing tackle rigged and tricing pennants released

When ordered, assist passengers embarking the boat. Assist Boat Crew with the release of bowsing tackles. Standby until boat is waterborne and then proceed to your liferaft."

Instruction No 11 lifeboat crew – stated:

"Once lifeboats are lowered to embarkation level, enter the boat and ensure all plugs are inserted. Attach bowsing gear in cooperation with Boat Preparation crew. Follow orders of 1 i/c to prepare boat by; Releasing Tricing Pennants, Ensure painter is fast to ship and boat. Prepare oars. When launching order is received, slack bowsing tackle forward and aft evenly. Lifeboat will be lowered by Boat Preparation team. Once waterborne release fall hooks and fend boat off ship. Release painter."

The first cook, who was one of the casualties, was allocated crew number 417. His designation on the muster/emergency plan was "lifeboat crew".

1.11 TRICING PENNANT AND PLATE LINK

The original design drawings show the fore and aft wire tricing pennants, having a safe working load (SWL) of 5000kg (49kN) compared to a SWL of 8004kg (78.5kN) for the falls. The pennants were connected to the davit arm and to a ring and shackle fitted to the "on-load" release hook, plate link (the falls were also connected to the same plate link). A 10mm round bar, painted yellow, was also welded to the plate link. This bar was not in the original design and was not a manufacturer's approved modification. Although no one on board had knowledge of its origin, it is likely to have been fitted to provide a method of manually moving the plate link when reconnecting the boat's "on-load" release hook.

The tricing hook was fitted with a release lever, which was secured from inadvertent release by a drop-nosed pin that passed through both hook cheek plates. The lever was required to be moved to its full vertical position to release the hook. To help avoid the risk of injury as the hook released, the lever was also fitted with tail rope so that it could be operated while standing away from the hook. The tricing hook and plate link arrangement is shown at **Figure 14**.

1.12 BOWSING TACKLE EQUIPMENT

1.12.1 Bowsing tackle ropes

The original design drawing for the bowsing gyn-tackle arrangement, which includes the tricing pennant, is shown at **Figure 15**. It was designed for a SWL of 5000kg (49kN) and a mechanical advantage of five. During the investigation it was found that the forward bowsing tackle used on No 5 tender was fitted with a 34mm diameter manila rope instead of the designed 26mm diameter manila rope. Only 4 of the 20 bowsing tackle ropes complied with the design dimensional criteria; all of the others exceeded 26mm to varying degrees.

1.12.2 Blocks and securing arrangements

Each set of bowsing tackle hooks was colour coded. The red hook was connected to the boat's lifting plate link and the yellow hook to a pad eye welded to the underside of the davit's lower, fixed supporting structure.

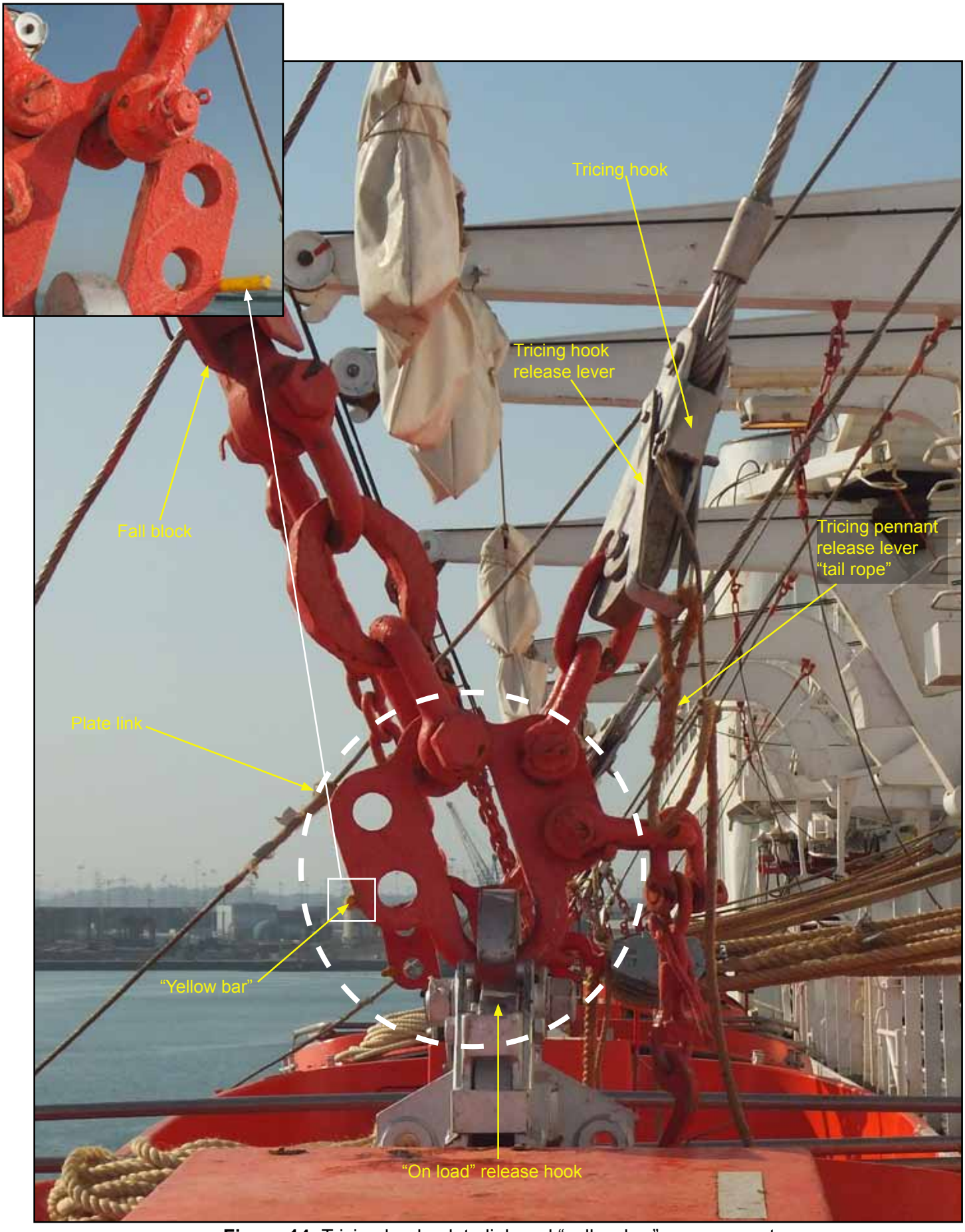

Figure 14: Tricing hook, plate link and "yellow bar" arrangement

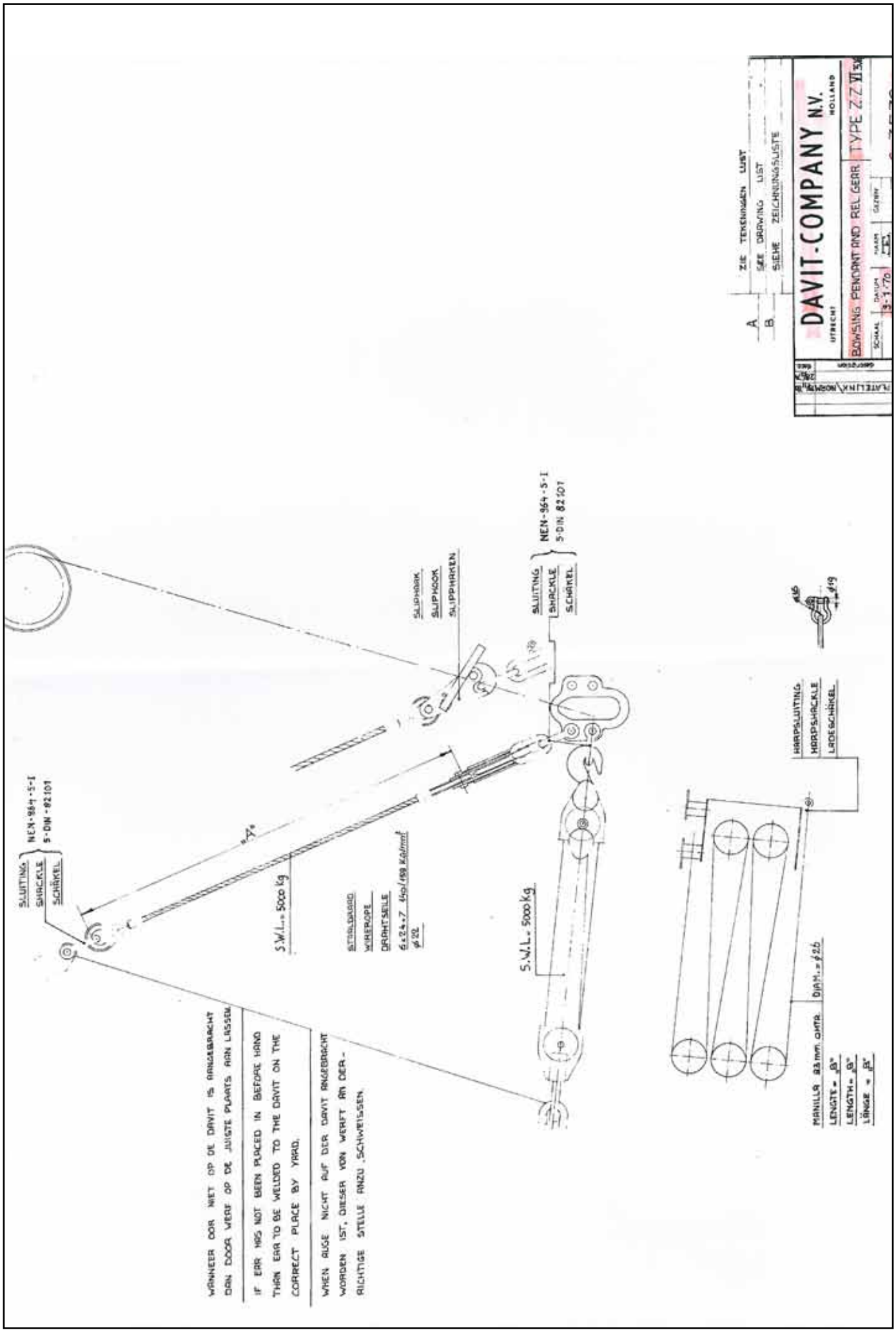

Figure 15: Davit - Company N.V. design drawing C.3570 dated 9 January 1970 - Type Z.Z.V1 Bowsing tackle and tricing pennant arrangement

Securing and control of the bowsing tackle ropes was managed by the lifeboat crew and preparation teams from on board the lifeboats. Once sufficient tension was applied to hold the lifeboat alongside deck 9, the rope was secured in figure-of-eight turns around the bitts welded to the block hooked to the boat's lifting plate link. The bitts were 50mm high from their base to the underside of the cap, and the distance between the inner faces was 80mm. The bitts' dimensions are shown in **Figures 16** and **17**.

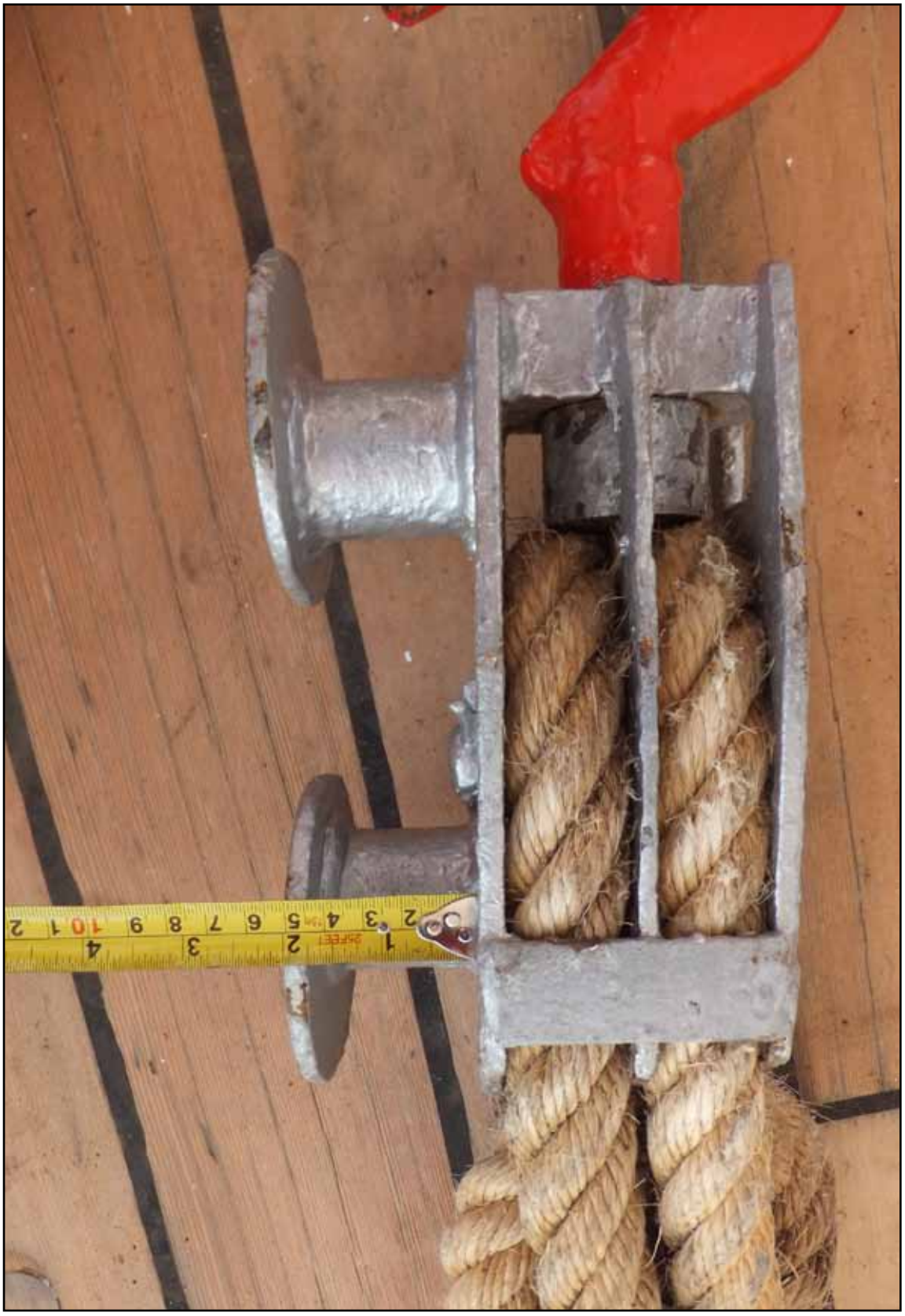

Figure 16: Height of bitts

Figure 17: Spacing of Bitts

1.12.3 Bowsing tackle changes

Pullmantur Ship Management Ltd first managed the ship in May 2004 when she was known as *Holiday Dream*. At that time, until the ship entered refit as the *Bleu de France* on 2 November 2011, a wire, strap and ratchet bowsing tackle arrangement was used on the tender/lifeboat **(Figure 18)**. The equipment was still on board when the vessel emerged from refit. Immediately after the lifeboats were brought back on board, the tackles were rigged to the boat. However, the ratchet handles were missing and there were no test certificates or other documentation approving their use or documenting their history. Consequently, it was decided to revert to the original equipment, which was in use at the time of the accident.

Following the accident, three-fold tackles, providing a mechanical advantage of six, were ordered to replace all the original equipment **(Figure 19)**. However, they proved to be extremely heavy and were not fitted with any securing arrangements, so they were also abandoned in favour of the original design.

While in Southampton, lighter two-fold tackles, with 24mm polypropylene ropes, were ordered. Again, these were not fitted with any bitts or other securing arrangements, and so the original design was reverted to, pending a review of how best to use the two-fold tackles.

After sailing from Southampton on 3 April, it was decided to use the newly acquired two-fold tackles. The rope securing problem was temporarily overcome by securing the tail around the 10mm bar (known on board as the “yellow bar”), which was welded to the boats’ lifting plate link **(Figure 14)**. This method provided a mechanical advantage of four. Acromas subsequently informally suggested to GL that sheer strake cleats be fitted to overcome the tail rope securing issues and to improve the efficiency of the arrangement to a mechanical advantage of five. This would enable the bowsing tackles to be controlled from on board the ship rather than on board the lifeboat. A simulation of the proposal is shown at **Figure 20**.

1.13 LIFEBOAT ISSUES AND TRIALS AT PALERMO

1.13.1 Refit work

The refit specification included mandatory lifeboat maintenance as required by SOLAS, Chapter III, Regulations 20 (Operational readiness, maintenance and inspections) and 36 (Instructions for on-board maintenance).

While the lifeboat general maintenance and inspections did not identify any major concerns, weight-testing of each of the lifeboats found that the majority were approximately 30% overweight when compared to their specified original weight. Based on the recommendations by the technical superintendent from Robert Hatecke GmbH, it was decided to re-foam the void spaces of Nos 7, 8, 9 and 10 lifeboats, and to remove as much water as possible from Nos 3, 4, 5 and 6 tenders and Nos 11 and 12 rescue boats by fitting additional drainage plugs to the void spaces. It was subsequently found that No 11 rescue boat required additional remedial work, and it was taken to Germany for this to be carried out. No 11 rescue boat was returned on *Saga Sapphire*’s arrival in Southampton.

Figure 18: Wire, strap and ratchet bowsing tackle

Figure 19: Three-fold bowsing tackle block

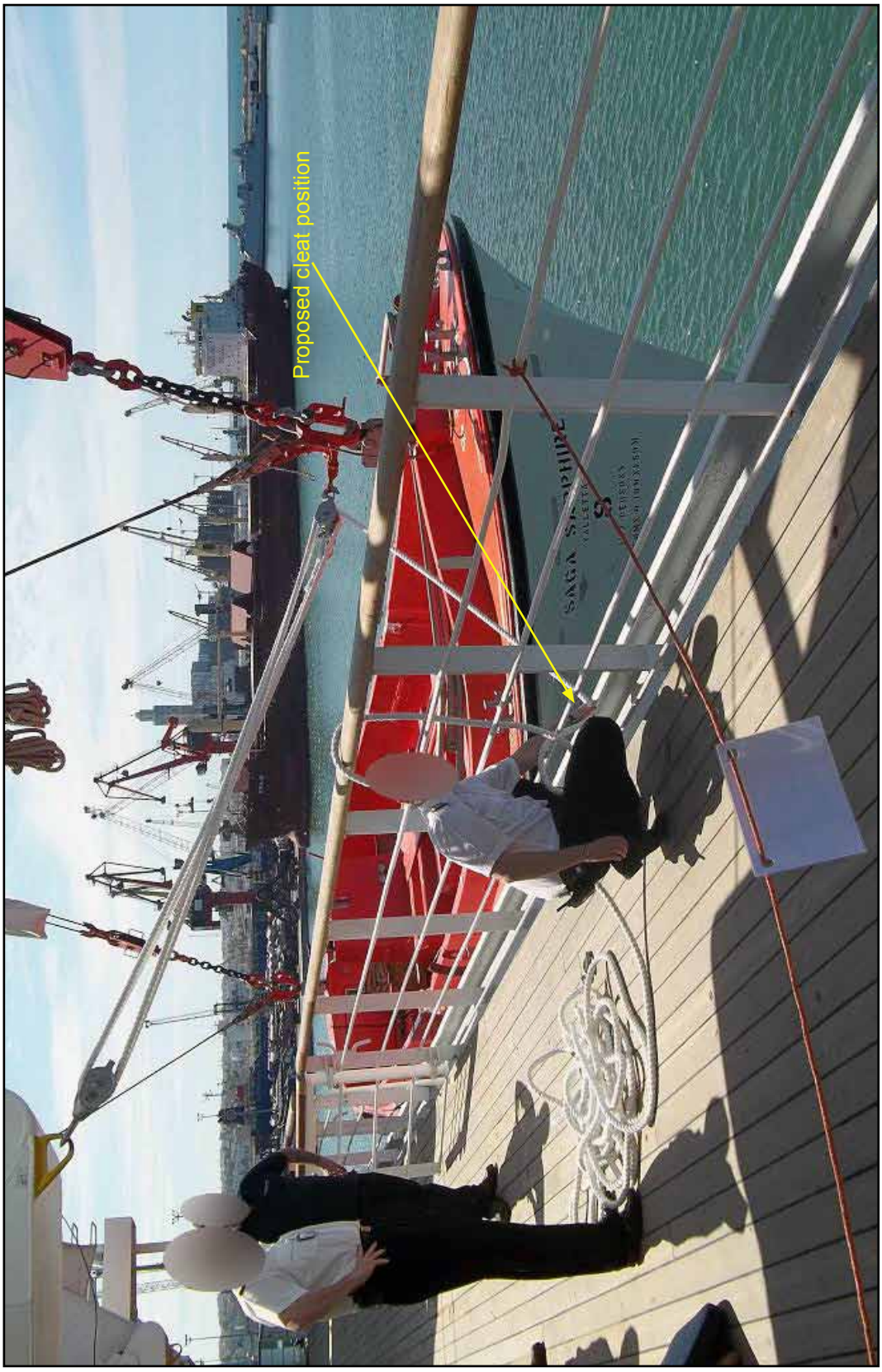

Figure 20: Proposal to use two-fold bowsing tackles secured to shear strake cleats

The emergent safety work on the other lifeboats was completed to both the manufacturer's and GL's satisfaction. However, it proved impossible to return the boats to their originally reported design weight. Table 1 shows the lifeboats' original passenger capacities together the post-remedial works revised capacities, as approved by GL and the Malta administration.

Lifeboat	3	4	5	6	7	8	9	10	11	12
Original capacity	70	90	90	90	120	120	120	120	44	44
Final capacity	70	63	63	62	107	107	106	103	40	44

Table 1: Lifeboat passenger-carrying capacity

On 14 March 2012 a Statement of Fitness was issued for each of the lifeboats by RC Hydraulics-und Industrieservice GmbH, the contractor who carried out the remedial work. After successful manoeuvring trials had been carried out, the starboard lifeboats were finally hoisted on board, using their davits, on 15 March. The port side lifeboats were placed on board using dockyard cranes, the same day.

1.13.2 Bowsing tackle defects identified in Palermo

None of the officers on board had previously operated the davits, lifeboats and their associated equipment as a composite unit. In preparation for the lifeboats' final lowering and hoisting functional test, which was to be witnessed by a GL surveyor, the bowsing tackles were rigged on the lifeboats. However, some of the ropes were very difficult to tension and slacken. Those of No 5 tender jammed tightly under the cap of the securing bitts and could not be released. The SO, chief officer and second officers were in attendance and notified the master of the issue. On inspection, it was found that the ropes, which had been left with the vessel by her previous operators, were too large. Examination of the other bowsing tackle ropes found that many were also very tight in their respective blocks. The master agreed with the deck officers that the ropes were to be changed to the correct size. While it is believed that one of the deck officers mentioned this to the second bosun, no one in authority checked that the work had been completed and some of the ropes, including those for No 5 tender, were not changed.

1.13.3 Trials

Depending on their individual availability, up to three GL surveyors witnessed the lifeboat manoeuvring trials. They had also regularly witnessed the operation of all the davits during post-defect rectification work load trials. On 15 March, surveyors also formally witnessed the lifeboats being lowered and hoisted when ‘on load’ release hook trials were conducted. It is unclear whether the bowsing tackles were fully rigged at this time, although their general satisfactory condition was noted. The lifeboats were not released from the falls because this had been witnessed previously.

1.14 FLAG STATE INSPECTIONS

The Flag State Inspections (FSI) on 17 March, were carried out in Palermo by an Italian marine surveyor on behalf of the Maltese administration. Section 15 – *Life-Saving Appliances* of the 13 March FSI Report identified that an assessment of the lifeboats and their equipment was not possible because the lifeboats were still undergoing repairs.

The FSI Report recorded that, on 17 March, all the lifeboat check requirements had been met. In particular, item No 1.5 of Section 15 – *Embarkation ladders, bowsing-in tackles in good cond* [sic] was "ticked" as being completed. Section 18 – *Additional Remarks/Comments/Deficiencies* identified the overweight lifeboat issue and other minor related deficiencies, none of which was related to bowsing tackles **(Annex E)**.

A further FSI was conducted, at Southampton, between 30 March and 1 April 2012. No lifeboat issues were identified during the inspection.

1.15 SAFETY MANAGEMENT

1.15.1 Organisation

Acromas' shore-based Marine Safety Officer was responsible to the Operations Director for ensuring the Safety Management System (SMS) was managed, maintained, implemented and audited.

Saga Sapphire's SO had specific responsibility, to the master, for implementing the electronic SMS which was in place on leaving Palermo. In particular, the SO was responsible for ensuring that:

- The maintenance of all fire-fighting equipment and life-saving appliances, including lifeboats, tenders and liferafts, was up to date.
- The crew received frequent instruction in fire-fighting, boat preparation and other training scenarios including that required by STCW.
- All safety documentation was kept up to date as required by the SMS, including the maintenance of the SO's Record Book, risk assessments, muster lists, personal protective equipment (PPE) register, and for ensuring PPE was in date for test.
- Safety Meetings were held each month.

A copy of the SO's Duties and Responsibilities as defined in the SMS is at **Annex F**. A relief SO arrived on board in Southampton on 26 March, but the existing SO did not hand over his responsibilities until 29 March and remained on board for a few days after the accident.

1.15.2 Safety Management System

While the electronic SMS was comprehensive, it was noted that many of the entries referred to *Saga Rose*, which was no longer part of the Saga fleet, and that the SMS applied to *Saga Sapphire* was omitted from many of the relevant sections.

1.15.3 Risk assessment procedure and Safety Committee meetings

Acromas had a two-fold approach to risk assessments. Firstly, generic risk assessments were held at the company's shore offices and were managed and updated by the company's Marine Safety Officer. The changes were transferred electronically and held on the individual ships' Marine Safety Management System.

Secondly, task-specific risk assessments, across the various ship departments, were required to be carried out in accordance with Section 4.5 – *Risk Assessments* - of the SMS, a copy of which is at **Annex G**. Risk assessments were developed using the Marine Safety Management System software. Once completed, the assessment was passed electronically to the company's Marine Safety Officer. The assessment was then reviewed, validated and returned to the originating ship and then held on the Marine Safety Management System.

It is notable that risk assessments were specifically required for tender operations and launching of lifeboats. At the time of the accident, no generic or task-specific risk assessments were held because the Marine Safety Management System had not yet been set to work following its installation during the refit. While the generic assessments were not held on board when the ship sailed from Palermo, they were in place when she sailed from Southampton on 3 April. It was noted that no individual deck-related task risk assessments had been completed when the ship was re-visited by MAIB inspectors in Dover on 21 May following her first cruise. However, soon afterwards, the risk assessment database started to be populated.

SMS, Section 4.9 – *Safety Meetings* - required that safety meetings be held monthly and that the minutes of the meeting be held in the SO's Record Book. At the time of the accident, the Safety Committee organisation had not been established and no related safety meetings had been held.

1.15.4 International Safety Management (ISM) Code audits

Two ISM audits were conducted by the flag state in Palermo. The first was carried out during 6-8 March while the ship was still heavily involved in refit work. As a result, there were a number of non-compliance items and 27 observations were made. The second audit was undertaken during 13-14 March. The report noted that while the mandatory certificates were held, the SMS was not fully implemented. However, a short-term Interim Safety Management Certificate (SMC) was issued valid until 13 April 2012 which covered the passage to Southampton. A further audit was conducted in Southampton during 2-3 April, after which another Interim SMC was issued which was valid until 2 October 2012. The accompanying audit report identified that no task-specific risk assessments had been made.

A company internal SMS audit was planned for the period 24-27 June 2012.

1.16 SAFETY HARNESSES AND THE PPE REGISTER

Immediately after the accident, the investigation found that nine safety harnesses were held by the deck department in deck lockers on deck 9. All the harnesses were manufactured by SpanSet UK in 1999 and were identified as Model BH1, Budget Harnesses. SpanSet UK sets a life of 5 years from manufacture for harnesses that are regularly used. After the accident, a requisition was made for 30 new safety harnesses, which arrived on board on 31 March.

At the time of the accident, a PPE register had not been established. Consequently there were no records of the PPE held on board, the expiry date of the equipment or any of the information required by the SMS. The Register was eventually started on 18 April. However, when this was reviewed by MAIB inspectors on 21 May, only three of the 30 new safety harnesses had been registered and there were no records of any other PPE.

1.17 MUSTER/EMERGENCY PLANS

The muster/emergency plan provided lifeboat and liferaft allocations, as well as details of the crew's emergency stations and individual duties. It also included instructions for discharging those duties. An individual's training requirement for his/her emergency role was largely based on this information.

Muster plan Versions 1-4 were developmental and the cancelled shakedown cruise imposed further late changes to the crew profile. Version 5 was the muster plan developed for sailing from Palermo to Southampton which was approved by GL. Crew members assigned a number up to 308 on the crew list, were allocated a muster duty. Crew members allocated number 309 and upwards were considered to be supernumerary and not given a muster plan duty.

As the final approved lifeboat-carrying capacity was received from the Malta administration, the muster plan was further revised. Version 6 was sent to the ship on 22 March for comment, together with an instruction for the STO to train to the duties specified on the plan. The plan was further updated to Version 7 but this became invalid when the Malta administration again refined the lifeboat-carrying capacities. This resulted in Version 8 of the muster plan being sent to the ship, electronically, on 23 March so that the training requirement could be further refined. GL approved Version 8 on 26 March, which was the muster plan in use when the vessel sailed from Southampton on 3 April.

1.18 TRAINING

1.18.1 Organisation

Within the Saga fleet, the ship's SO was responsible to the master for the management of all aspects of onboard crew training (See Section 1.15.1). When conducting training sessions, he was assisted by officers of the deck and engineering departments. The company also contracted a specialist fire-fighting training team which was used on all Saga vessels to ensure crews were trained to a consistent level.

The company's STO complemented the ship's SO in his crew training role. He was accountable to, and was managed by, the Marine and Port Manager. While on board, the STO was directly accountable to the master but was required to liaise with the ship's SO. He was also required to provide a progress report, each month by e-mail, to the Marine and Port Manager so that future training could be targeted to particular areas of concern.

The identification of shore-based training requirements was the responsibility of the company's Marine Safety Officer. He worked with the shore-based departmental personnel supervisors, to ensure that new crew had the correct STCW basic training and certification for their role. Where there was a shortfall he would, where possible, arrange the appropriate training before the crew joined a vessel.

1.18.2 Operational ships - training requirement

The annual, routine safety drill requirement was produced by the company's Marine Safety Officer and was laid out in Section 6 of the SMS.

The company's STO was guided by the vessel's Certificate Checklist matrix when developing specific training programmes. The matrix included the requirements for crews' "Basic Certification", "Advanced Certification" and "Company Required Training" and was based on the duties as defined on the muster/emergency plan. A copy of page 1 of the matrix is at **Annex H**. Before joining a vessel, it was the STO's practice to contact the crew purser to identify any crew training shortfalls against the Certificate Checklist matrix and focus his training in those areas. He would also adjust the programme to reflect any specific training requirements identified by the master and the ship's SO.

1.18.3 Non-operational ships - training requirement

None of the Malta administration, GL, or the ship's manager stipulated any particular change in training emphasis for a vessel emerging from refit which was over and above that applicable to an operational vessel.

1.18.4 Training delivery

During the early stages of *Saga Sapphire*'s refit there were about 120 crew on board, comprising 20 deck, 20 engineering and about 80 hotel staff. During this time, the STO undertook the role of fire-watch officer and managed the hot work fire sentry requirement. Towards the end of February 2012, the majority of hot work had been completed and the STO started his training programme which was commensurate with the crew build-up.

Determining the crew's training requirement and promulgating the weekly training planning schedule was left entirely to the discretion and experience of the STO. While there was no high-level training guidance, the STO produced a comprehensive training programme. However, there was no input by the ship's SO other than an agreement that the SO would be responsible for delivering of fire-fighting and liferaft preparation training. Training commenced on 20 February. Example copies of the training schedules for weeks commencing 20 and 27 February and 5 and 12 March 2012 are at **Annex I**.

The first drill was carried out on 3 March. Drills were subsequently scheduled each day at 1830 to maximise the working day, commencing 5 March until arrival at Southampton, although some were cancelled at short notice.

During *Saga Sapphire*'s passage to Southampton, the training requirement had to be re-assessed following receipt of Version 8 of the muster/emergency plan. The master felt the need for additional training effort and oversight in preparation for the forthcoming MCA-monitored drills. The master was also concerned that no liferaft preparation drills had been conducted. Consequently, during one of the morning management meetings, attended by the ship's senior officers, on or about 24 March, the master formally instructed the ship's SO to assist the STO and carry out liferaft training.

While in Southampton, Code Bravo (fire) drills were carried out on 26, 27 and 28 March in preparation for the MCA's expanded PSC inspection planned for 29 March. During the drills, the crew went to their lifeboat/liferaft stations but the lifeboats were not lowered and the bowsing tackles were not rigged.

The STO maintained a comprehensive record of all crew who attended the training sessions.

1.18.5 Training feedback

The STO provided intermittent feedback to the master about the training programme either by e-mail or at the early morning refit progress management meetings which he occasionally attended. The master encouraged the STO to apprise him of the progress being made and any related concerns. He also advised the STO that the passage to Southampton would provide an opportunity to concentrate on training. Although the STO was reportedly unable to provide feedback to the Marine and Port Manager because of e-mail connectivity problems, he did provide him with verbal progress reports during his visits to Palermo.

1.18.6 Lifeboat-related training

The STO was unfamiliar with the lifeboat's "on-load" release hook arrangements and felt that it would be unwise to conduct related training himself. He made enquiries with the manufacturer to identify if training aids were available and if they could provide on-site training. Both options proved to be prohibitively expensive.

Concerned about the situation, the STO informed the master that he did not wish to conduct lifeboat-related training but was willing to assist. The master accepted the STO's rationale and advised him to discuss the issue with the ship's SO. The STO did not discuss this issue with the SO, so the lifeboat-related training responsibility was not formally transferred to any one person; however, anecdotal evidence indicates that the ship's SO was fully aware of the situation.

The only lifeboat preparation training scheduled by the STO up to the time of the accident was on 6 March and 13 March. However, training did not occur on either of these dates because the relevant crew were not available, being off watch, or involved in engine room cleaning tasks or hot work sentry duties.

On 14 March, an adhoc set of pre-sailing lifeboat preparation training was carried out. The STO was in attendance as an observer, and it is reported that the chief officer informally discussed the general procedure for lifeboat preparation, although the lifeboats had not been embarked at that point.

It is noteworthy that the injured first cook, who was nominated as lifeboat crew, was not one of those who attended the training on 14 March.

1.19 SHIP-FAMILIARISATION TRAINING

Each new officer and crew member was required to undergo the ship's familiarisation training programme. Training comprised a familiarisation introduction by the respective department head and completion of four comprehensive, animated presentations that had been developed by the STO. On completion, a test was undertaken and, if successful, the person was awarded the Acromas Shipping Ship Familiarisation Certificate. The certificate also gave an outline of the content of the modules **(Annex J)**.

Modules 1 and 3 are relevant to this case. Module 1 included "Muster List and Emergency Duties". The latter covered the overall actions the crew were to take in an emergency situation rather than what an individual's emergency duty entailed. Module 3 covered "Liferafts, Lifeboats and Sea Survival" aspects.

1.20 ACCESS TO TENDERS ON BOARD *SAGA RUBY*

Access to the bowsing tackle arrangements fitted to the tenders/lifeboats on board *Saga Ruby* required the lifeboat preparation/ lifeboat crews to climb onto the coach roof. There were no readily accessible strong points on the lifeboats/tenders to which to attach a safety harness tether. To overcome this, webbing jacklines, running fore to aft, were fitted to the glass reinforced plastic (GRP) coach roof to which a safety tether was attached **(Figure 21)**. The jacklines were secured to shackles fitted to eyebolts which passed through the roof. The shackles were fitted to the eyebolts with, what appeared to be, a standard nut and bolt arrangement which had been prevented from slackening by a split pin **(Figure 22)**. The issues relating to this arrangement are discussed at Section 2.10.

1.21 SIMILAR ACCIDENTS

1.21.1 MAIB's Safety Study 1/2001 – Review of Lifeboat and Launching Systems' Accidents

The MAIB published its Safety Study 1/2001[6] following a review of its accident database. The subsequent analysis showed that, over the preceding 10-year period, 12 professional seafarers lost their lives in accidents involving lifeboats and their launching systems. This represented 16% of the total lives lost on merchant ships during the period. These accidents all happened during training exercises or testing, with experienced and qualified seafarers either performing or supervising the operations.

The executive summary identified that the root cause of many of the accidents was:

> *"…the over-complicated design of the lifeboat launch system and its component parts, which in turn required extensive training to operate…"*

and

> *"…training, repair and maintenance procedures fell short of what was necessary, …."*

The study identified that during the review period there were 10 incidents, resulting in five injuries and the loss of two lives that were directly related to tricing and bowsing arrangements.

Section 2.2 – *Bowsing and Tricing* - of the study covers the operational and design aspects related to bowsing and tricing arrangements. A copy of the section is at **Annex K**. In particular, it identified the dangers associated with not using bowsing tackles and those related to taking the full passenger loading jointly on the tricing pennants and the davit falls.

[6] The publication is available on the MAIB's website at www.maib.gov.uk

Figure 21: *Saga Ruby*'s tender jackline and tether arrangement

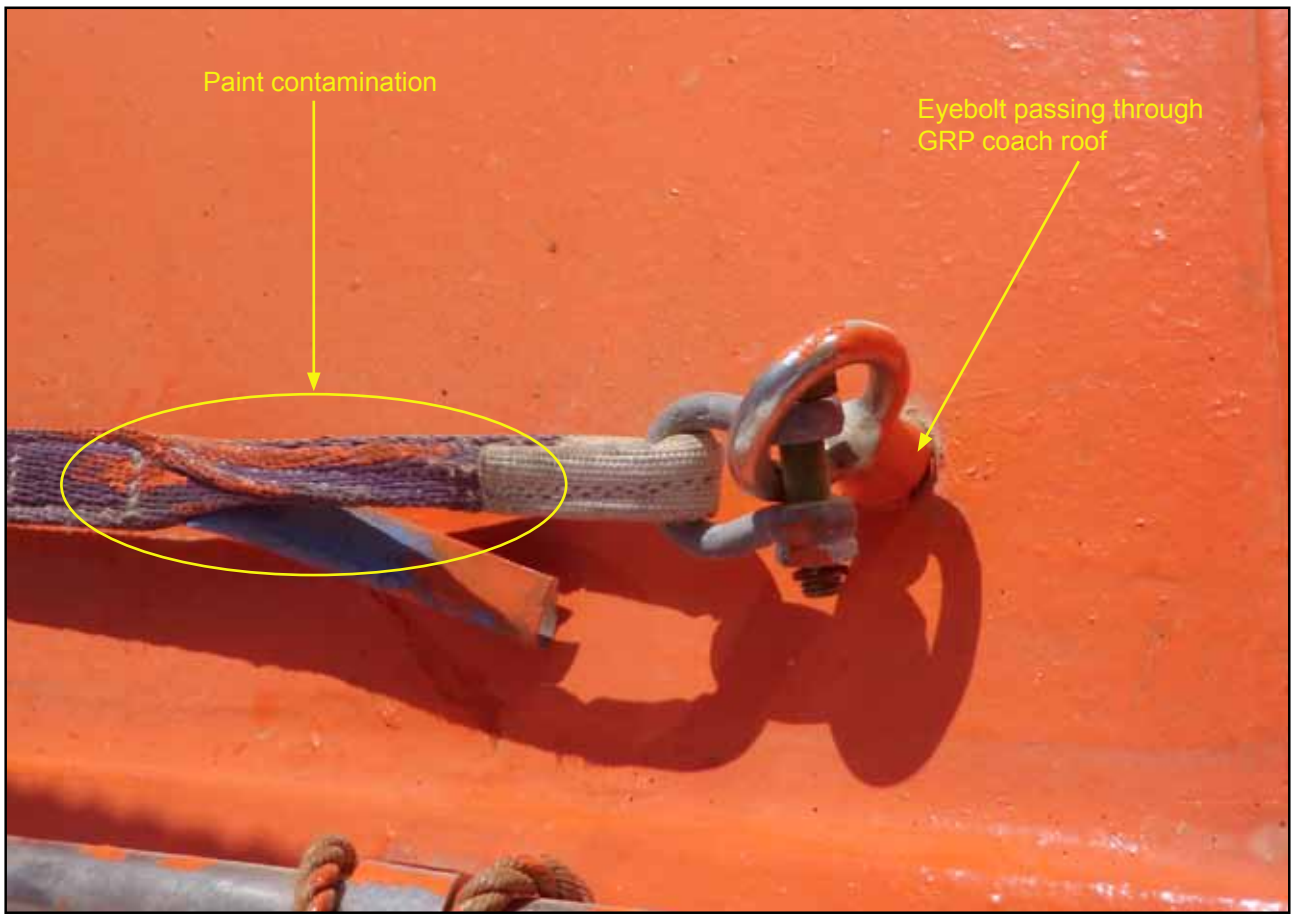

Figure 22: *Saga Ruby*'s tender jackline securing arrangement and jackline paint contamination

1.21.2 mv *Norsea*

On 5 February 1992, the ro-ro passenger ferry *Norsea* was berthed in Hull and was undergoing tests on a new band-bowsing system (BBS) designed to replace the conventional bowsing and tricing arrangements. Two seamen were stationed in the forward and aft hatches of No 3 lifeboat, and were attempting to release the BBS. During the operation, the aft end of the boat swung outboard as the after BBS released in an uncontrolled manner. The dynamic loading caused the davit arm to be forced out of its supporting trackway leading to the progressive collapse of the davit. The lifeboat fell, upside down, into the dock and two of the four crew died. The accident was caused by a combination of trackway distortion, fall wire shift and the BBS-induced moment caused as the lifeboat swung violently away from the ship's side.

1.21.3 Lifeboat bowsing equipment-related accidents 2005 – 2010

The MAIB's accident database records seven bowsing tackle-related accidents between 2005 and 2010 which caused lifeboats to swing uncontrollably and violently out from the ship's side with varying consequences. The accidents, which were dealt with as administrative enquiries, have been grouped by type in the following paragraphs.

Between 2005 and 2008, there were three accidents as a result of the tricing pennants being released without first connecting the bowsing tackles. Two of the accidents resulted in severe bruising of the crewmen, and the third caused a crewman to fall from the lifeboat and make contact with the ship's side. Despite suffering a compound fracture of his leg, he managed to swim to the quayside, where he was recovered.

Between 2006 and 2010, there were four accidents which resulted in the uncontrolled release of the bowsing gear. These were reportedly due a combination of lifeboats not being correctly bowsed into the ship's side, the BBS brake malfunctioning and one case of the bowsing rope coming off the inboard block's bitts as the crewman tried to operate the tricing hook release lever. The accidents resulted in two cases of severe bruising, one case of deep lacerations to the face, and one case of a dislocated shoulder.

1.22 OTHER RELEVANT ACCIDENTS – OVERWEIGHT RESCUE BOATS

The issues relating to *Saga Sapphire*'s overweight lifeboats and how these related to the accident, are dealt with at Section 2.6.3. The inclusion of the mv *Tombarra* accident below, serves to illustrate the potential severe consequences of undetected, overweight lifeboats. The accident report and related MAIB Safety Bulletin 1/2011, are available on the MAIB's website at www.maib.gov.uk.

1.22.1 mv *Tombarra* – overweight rescue boat

On 7 February 2011, the fall wire attached to mv *Tombarra*'s rescue boat parted during a routine drill. The rescue boat and its four crew fell 29m into the water below. One of the crew died and two were hospitalised. The rescue boat was subsequently weighed and found, at 1450kg, to be 48% overweight. Although other factors were more directly related to the failure, when the boat was in fully laden state it exceeded the SWL of the davit. The weight growth was due to water penetration into the hull's foam-filled compartments.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 ACCIDENT OVERVIEW

The process to prepare No 5 tender in readiness to evacuate passengers, as part of the MCA's expanded PSC inspection, should have been straightforward. However, the first cook's inadequate understanding of his lifeboat crew duties resulted in him being unable to operate the forward bowsing gear and to release the tricing pennant safely when instructed to do so. When the fourth officer saw that the first cook was having difficulty in releasing the tricing pennant, he instinctively went to help his colleague. This was entirely consistent with his supervisory responsibilities during lifeboat drills. However, his intervention set in train a sequence of events which resulted in the uncontrolled, coincident release of the forward bowsing tackle and tricing pennant. This resulted in the fore end of the lifeboat swinging violently away from the ship and then heeling to port. Without the protection of a safety harness and tether, the fourth officer and first cook fell into the water as they lost their footing on the smooth coach roof.

The subsequent rescue of the two men from the water, and their medical treatment, was rapid and well-managed.

2.3 FAILURE MODE

When a lifeboat is lowered to embarkation deck level, the load is shared between the falls and the tricing pennant with the tricing pennant load being appreciably less than the lifeboat's weight. When the bowsing tackles are connected and correctly tensioned and the tricing pennants released, the bowsing forces are virtually horizontal and the falls support almost all of the weight of the lifeboat. As the bowsing tackles are released under control, the lifeboat adopts the plumb position directly under the falls, and the fall forces and weight of the lifeboat are in line. Controlled lowering can then begin. A schematic of the direction of forces is shown in Figures 5 and 6 of **Annex K**.

During the re-enactment carried out on 29 March, it was possible to observe the sequence of events which led up to the accident. As the first cook moved away from the tricing pennant to provide space for the fourth officer, he moved the bowsing tackle tail rope out of line with the bowsing block on whose bitts the rope was secured. This resulted in the bowsing rope slipping entirely off the bitts because the rope was oversize (see Section 1.12.1). The first cook then tried to maintain the necessary tension on the bowsing tackle to keep the lifeboat alongside, but without the assistance of it being secured to the bitts. At the same time, the fourth officer released the tricing pennant hook. The first cook was unable to maintain the tension on the bowsing rope and, without the bowsing tackle to restrain the lifeboat, the fore end swung out violently to align the weight of the lifeboat with the falls. However, the aft bowsing tackle was still secured, which resulted in the lifeboat adopting an exaggerated heel to port, causing the fourth officer and first cook to slide off its deck.

2.4 DESIGN ISSUES – LIFEBOATS AND BOWSING AND TRICING PENNANT ARRANGEMENTS

Continual development of the rules and regulations relating to lifeboat launching systems are predominantly aimed at improving both safety and reliability. However, there are many existing systems which, although they satisfy the regulations, are not equipped for remote operation and still require personnel to access areas of potential risk.

2.4.1 Lifeboats – access to bowsing tackles and tricing pennants

The design of No 5 tender, which was built in 1981, provided for two hatches on the coach roof immediately adjacent to the forward and aft “on load” release hook positions. There was a perception that the bowsing and tricing arrangements could be accessed and released through these hatches, which would have obviated the need to access the coach roof. This is not correct. The hatches are designed for ventilation purposes.

During the accident re-enactment, the option to use the ventilation hatches to access the bowsing tackle and tricing pennants was examined as an alternative to standing on the coach roof. An officer who was about 1.9m tall was unable to operate the tricing release lever, and access to the bowsing tackle was very restrictive **(Figure 23)**. Given that most of the lifeboat crew were Filipino nationals who averaged about 1.7m in height, the option of operating the release equipment from the hatches was not viable.

The same issue was also observed when the lifeboat crew attempted to operate the tricing pennant hook release lever from within the open lifeboat, while standing on the forward bench seat. Again, because of crew height limitations, in most cases it was not possible to do so safely.

In the case of both the tenders and open lifeboats, the only satisfactory way of accessing the bowsing tackle and tricing pennant arrangements was by standing on the coach roofs of the tenders and on the stem and stern compartment roofs of the open lifeboats. Despite The LSA Code and Section 3.10 of MSN 1676(M) (see Section 1.9.3) requiring these surfaces to be applied with a non-skid finish, none was. The surfaces were smooth, making it easy for the lifeboat crew/preparation party to slip off them if there was sudden movement of the lifeboat, especially in wet weather conditions.

Review of the Malta administration’s FSI Report checklists dated 13 and 17 March and 30 March to 1 April 2012, and GL’s Survey Statement dated 19 March 2012, showed that the inspections did not identify the omission of non-skid surfaces.

2.4.2 Bowsing tackle and tricing pennant arrangements

The bowsing tackle and tricing pennant arrangements in use at the time of the accident were those originally provided to the vessel. The system of securing the bowsing tackle tail rope onto the set of bitts welded to the block fitted to the lifeboat lifting plate, although dated, was still in use.

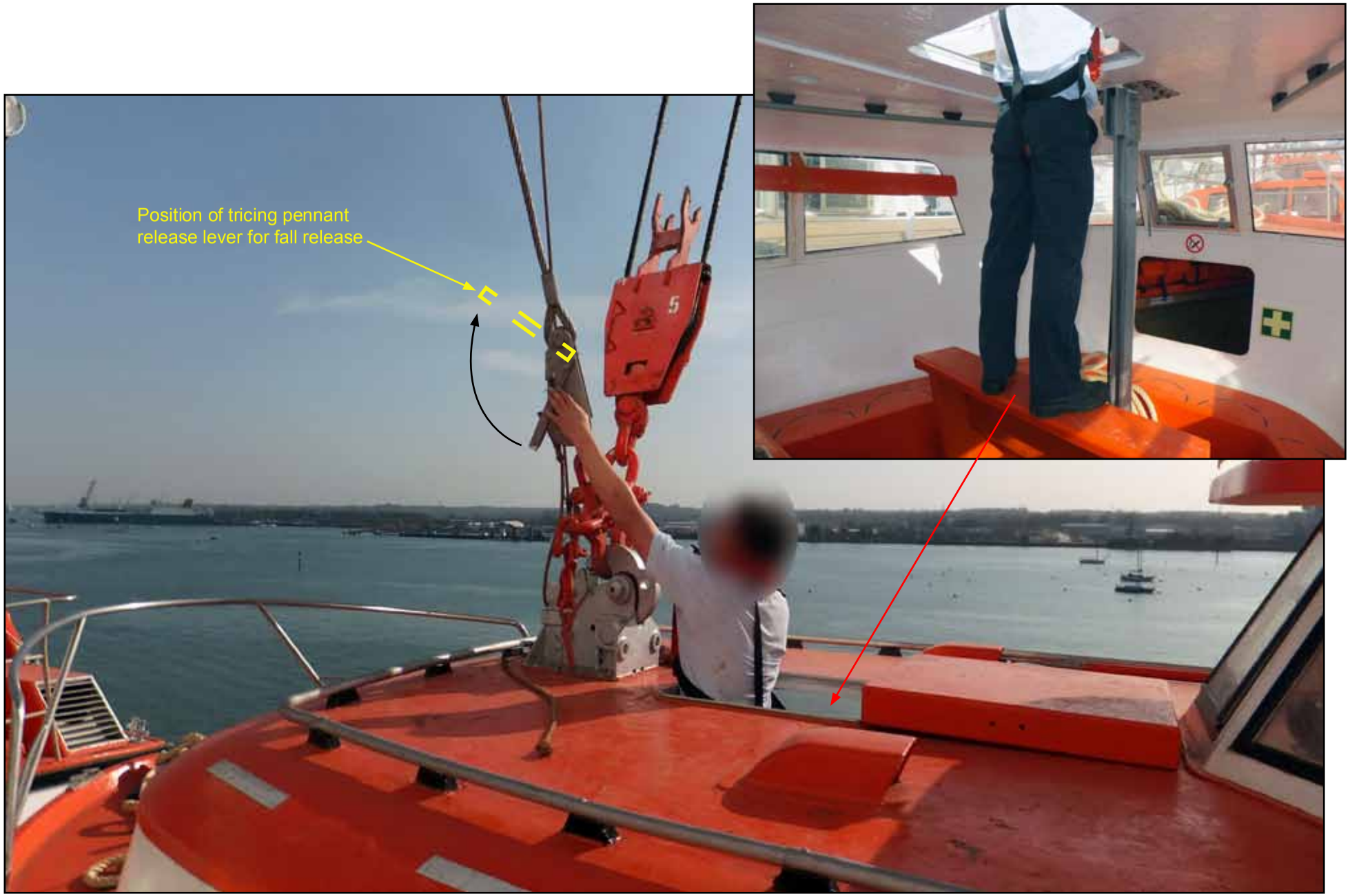

Figure 23: 1.9m tall officer attempting to reach the tricing pennant release lever from the tender's coach roof forward hatch

The process of having a single crewman to secure and hold the bowsing tackle rope and, at the same time, remove the drop-nosed pin securing the tricing pennant release lever, and then operate the tricing pennant release lever, risks overloading the crewman. The dimensions of the bitts allowed for two figure-of-eight turns of the bowsing rope around them. In most circumstances, this was likely to be sufficient to maintain the necessary tension to keep the lifeboat firmly alongside if the tail rope is held. However, if the crewman stepped out of line with the bitts, there was a significant risk of the rope slipping off the bitts and releasing, causing the lifeboat to swing away from the ship's side.

Acromas' initial proposal to fit sheer strake cleats on *Saga Sapphire* so that the tension on the bowsing tackles is applied from the ship, and not from the lifeboat, would have helped to resolve the issue of lifeboat crew overload. Discussions with the original designer did not identify any objections with this proposal. However, Acromas has decided that it is more beneficial to have a common bowsing tackle operation across its fleet. To revise the procedure would have meant three different operations on the company's vessels. This is relevant as crew members serve on all vessels, and the introduction of a new procedure could lead to confusion and further accidents.

2.4.3 Use of the "yellow bar"

The interim procedure to use the existing bowsing block arrangement, but securing the tail rope to the "yellow bar" which has been welded to the plate link of the boats, is potentially unsafe. The bars were added after the blocks entered service. There is no record of them being load-tested and they may well be unfit for the purpose for which they are now being used. If this securing method is to continue, the bar's SWL requirement should be identified and it should be appropriately load-tested and approved.

2.4.4 Bowsing tackle ropes

Freely running ropes and blocks are essential for the efficient and safe operation of the bowsing arrangement so that the system can be properly controlled. The use of the oversized ropes, first identified during refit in Palermo, compromised that safety. This was recognised by the master, who instructed them to be changed. However, insufficient priority was given to this. The management of the rope changes was inadequate and there was no involvement of the ship's safety management team, whose responsibility it was. No one was clearly nominated to take control of the changes and there was no process in place to confirm they had been completed. The dangers manifested themselves when the first cook was only able to put one figure-of-eight turn around the forward bowsing block bitts on No 5 tender. It was this which allowed the rope to come easily off the bitts and initiate the accident.

It has not been possible to identify any specific classification society requirements for bowsing equipment. However, Acromas' proposal to use the two-fold bowsing tackles with 24mm polypropylene ropes is generally compliant with the standards laid down in the MCA's Instructions to Surveyors - MSIS 14 – Survey of Life-Saving Appliances: Volume I, a copy of which is at **Annex C**.

2.5 OPERATIONAL INSTRUCTIONS

Clear and unambiguous lifeboat launching instructions are vital for crew to understand such operations, and so reduce the risk of failure. Contradictory instructions only serve to confuse and compromise safety.

2.5.1 Instructions for releasing tricing pennants

Sub-Section 2.2.1 – *Operational*, of Section 2.2 – *Bowsing and Tricing*, of the MAIB's Safety Study 1/2001 **(Annex K)** highlighted the danger of overloading tricing pennants potentially leading to their failure. Because the horizontal force component of the bowsing tackles is small, the vast majority of the lifeboat load is shared between the tricing pennants and the falls. This remains so until the tricing pennants are removed, when the majority of the load is then taken by the falls as designed. If the pennants remain connected when the lifeboat is loaded, there is the risk of overloading them. The conventional procedure is to tension the bowsing tackles, release the tricing pennants and then embark crew/passengers to prevent the overload situation.

2.5.2 Variation in instructions

The poster provided at the lifeboat winch control position **(Figure 24)** reflects the procedure outlined in Section 2.5.1 above, as does the text in the Section 8.3 – *Launching the Lifeboats* - in the ship's LSA Training Manual **(Annex D)**. However, the "Launching Instructions for Open Lifeboat" poster, provided at Section 8.2 – *Lifeboat Davits* – of the LSA training Manual **(Annex D)** and, the original, 1981 lifeboat davit operating manual, extract at **Annex L**, is at variance with the above instructions. Both instructions require that the tricing pennants be released *after* the passengers have been embarked i.e. in the potential overload situation.

The variation in the instructions is confusing and could possibly cause overloading of the tricing pennants leading to their failure. In this case, the lifeboat could swing violently away from the ship's side, especially if the bowsing gear is not properly tensioned, and possibly also lead to structural failures. If a failure occurred when passengers were still embarking, they would be at risk of injury or falling overboard.

The instructions merit review for consistency of approach and to minimise risk to passengers, crew and structure.

2.5.3 Company's post-accident operational advice

Following the accident, Acromas promulgated the circumstances of the accident to the Saga fleet and instructed that they were to be discussed during safety meetings.

The instruction also stated that, during drills:

> *"… no one should need to be standing on top of tenders for launching. They are all designed to be released via hatches, if there are issues with personnel using these hatches due to issues such as height, then we need to think about solutions to these problems rather than climbing out onto the cab which then poses a risk to personnel".* [sic]

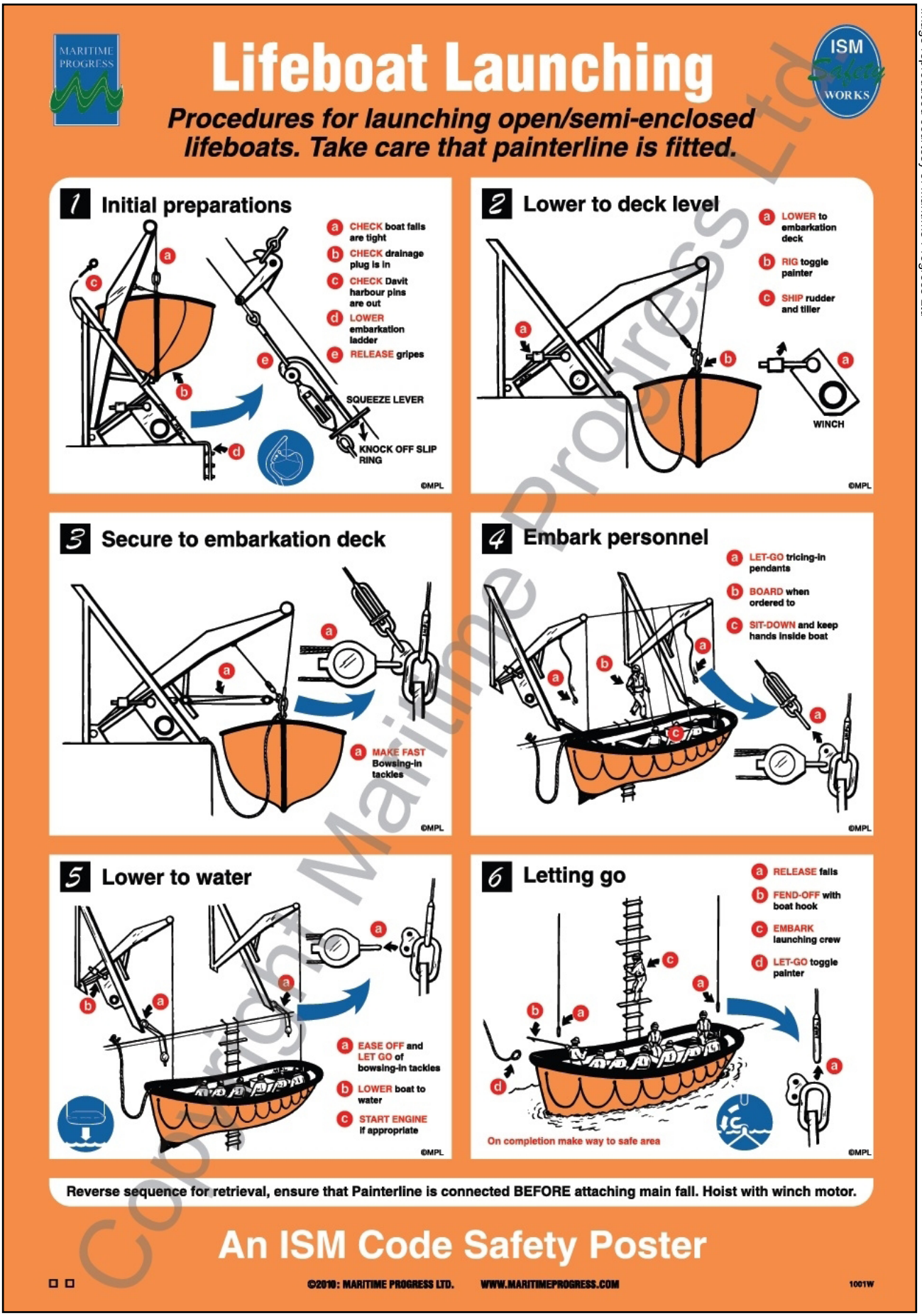

Figure 24: Lifeboat launching instruction poster positioned at the lifeboat winch control position

The instruction was important in that it alerted the fleet to the accident's learning points. However, it was also confusing in that it advised that there should be no need for crew to stand on top of the tender's roofs to operate the launching equipment as it could be released from the open hatches. This was not possible in the case of *Saga Sapphire*'s tenders (see Section 2.4.1).

2.6 TRAINING-RELATED ISSUES

2.6.1 General

A ship emerging from a prolonged refit is at far higher risk than her operational counterpart or one that is coming out of a traditional 2-3 week docking period. Many of the crew will be unfamiliar with the equipment, they will not have worked as a team, and many of the systems will have been unproven in an operational environment. These points were all factors in this accident and, combined, serve to emphasise the importance of properly managed and targeted training.

2.6.2 Training management

While the training requirement for operational ships was well-defined in the SMS, there was no comparable, top-level, endorsed training needs specified for ships coming out of refit. The scope and management of training was left almost entirely to the discretion of the STO, with virtually no input from either the ship's manager or the ship's safety management organisation. Although the STO provided training feedback to the master, this arrangement was seldom part of any formal meeting and was generally given verbally on an opportunity basis, and occasionally by e-mail.

The STO's terms of reference required him to report directly to the master on training-related issues. This arrangement by-passed the ship's SO, who was also responsible to the master for the conduct of onboard safety training. Because the SO was engaged in managing fire watchers, in overseeing the maintenance of fire-fighting equipment and sliding watertight doors, and in developing the constantly changing muster/emergency plan, he was content for the STO to assume the training responsibility. Despite having the ship's overall training responsibility, there was no evidence that the onboard safety management team provided anything other than a superficial level of training oversight during this critical period.

As the delays to the refit continued, the master, as well as other senior shore-based managers, became increasingly involved in the refit project management in order to mitigate the possible revenue losses as a result of the changing cruise schedule. This commercial pressure impacted on the ship's management team's focus on preparing the vessel for passenger service.

It was always the master's intention to concentrate the training effort on the ship's passage to Southampton in preparation for the MCA-supervised drills, and for receiving the first passengers. However, the refit work continued during the passage, and many of the hotel department staff were involved in preparing the public areas for service. The crew were also engaged in rectifying the defects identified at the FSI conducted in Palermo and in preparing for the forthcoming FSI, GL survey and other aspects of the MCA expanded PSC inspection.

This increasing commercial pressure, which continued through to Southampton, inevitably resulted in a change in focus, with the penalty that other ship-related activities did not receive the level of attention that the master wished for. Part of this penalty was training oversight. Although the master advised the SO of the need to prioritise lifeboat training, there was an opportunity to better engage the ship's SO in this respect, to ensure training was being carried out. However, the risk was not recognised early enough by the vessel's senior management, and it was not until 2 days before the ship's arrival in Southampton that the SO assumed a more active training role.

2.6.3 Impact of refit work on training

There was no evidence that the need to allocate time for training had been integrated into the refit project management plan. Had it been, then the impact of other refit-related work over-running might have been reduced.

In particular, the training delivery was affected by non-attendance of the crew because they were engaged in other FSI and GL survey-related work. Many of the public broadcast speakers were not functional and the crew were unaware of broadcast instructions. High noise levels, especially from music being played on the outside broadcast speakers as part of the system set-to-work, had a negative effect.

The delay in returning the lifeboats to the vessel until shortly before the completion of the refit in Palermo severely restricted the ability of the crew to conduct realistic lifeboat training.

The delays in the refit completion date also resulted in multiple changes to allocated responsibilities in the muster/emergency plan. As the plan was the basis for the STO's training schedule, it followed that each change to the plan had a negative impact on training continuity. The STO raised the issue with the Marine and Port Manager but it was not resolved until the latter days of the ship's passage to Southampton, when the final GL-approved, muster/emergency plan was received on board and the STO was able to produce a definitive training requirement.

2.6.4 Lifeboat preparation training

The importance of properly supervised, comprehensive training and realistic drills in developing a clear understanding of the safe procedures for lifeboat launching cannot be over-emphasised. The consequences of not doing so are clearly illustrated by the previous accidents highlighted at Section 1.21. Proper preparation gives the ship's management team and crew the confidence to operate the equipment and the ability to react promptly and safely in a "real" emergency, when lives are potentially at risk.

The ship's familiarisation training was comprehensive and well-managed. Module 3 of the structured training included a generic lifeboat preparation slideshow. However, this training was intended as a general introduction for all crew members rather than specifically for the dedicated lifeboat preparation/crew teams.

The quality and management of the lifeboat preparation training were below the standard necessary for the lifeboats to have been launched safely by the crew nominated on the muster/emergency plan. This was largely due to the late return of the lifeboats and the lack of any person formally taking control of the related training,

despite the STO advising the master that he was unwilling to conduct lifeboat-related training. Although the master indicated to the STO that he should consult with the SO on the matter, this was not actioned by the STO predominantly because he had difficulties liaising with the SO.

The only pre-sailing lifeboat preparation training period was carried out on 14 March. Its effectiveness was severely hampered because none of the lifeboats was on board. Furthermore: the chief officer, who was informally discussing the procedures with the attendees, was called away on a refit-related matter; the noise levels from the public address system were very high; and, only 6 out of 30 members of the nominated preparation teams attended[7]. Despite the inadequacy of the training, the session was not repeated and there was no record why those who should have attended had not.

2.6.5 First cook's experience

This was the first cook's first ship since completing his training in Manila in February 2012. He had never operated lifeboat tricing or bowsing equipment until the time of the accident. His need for training had not been identified and he was placed in a vulnerable and unsafe situation because those involved in training management had failed to identify his lack of experience and to ensure that he had received sufficient training for his role. Had the poor quality of the lifeboat preparation training issues, identified at Section 2.6.4, been acted upon, he might have received sufficient training to have prevented the accident.

2.6.6 Identification of crew required for lifeboat training

The STO used the muster/emergency plan and the Certificates Checklist to identify training needs and promulgate them on the weekly training schedule. While the schedule identified "Lifeboat Preparation Team" training, the muster list separated the lifeboat teams into "Lifeboat Preparation Team" and "Lifeboat Crew". The first cook was designated to be part of the "Lifeboat Crew". The terms can be confusing and, in the training schedule, it would have been appropriate to designate the training session as being applicable to both teams.

In addition, the Certificates Checklist did not identify the need for lifeboat or liferaft preparation/crew training despite this being a key role for non-deck department crew. This omission, together with liferaft preparation team training, merits review for inclusion in the Certificates Checklist.

2.6.7 Conclusion

The poor standard of lifeboat preparation and crew training, which contributed to this accident, was largely due to no one taking ownership of the lifeboat training requirements or providing adequate oversight. The situation was exacerbated by the combination of the late delivery of the lifeboats, which limited the training window, and changing training requirements due to the refit slippage, which resulted in changes to the crew build-up profile as reflected on the muster/emergency plan.

[7] This number does not include the lifeboat crews.

2.7 DECISION TO SAIL FROM PALERMO

2.7.1 Master's decision

The ultimate decision to sail from Palermo to Southampton was made by the master in consultation with the Marine and Port Manager who, as the Deputy Designated Person Ashore (DPA), was in Palermo in the DPA's absence.

Despite the pressure of the prolonged refit and the need to limit any further delays to the revenue-generating cruise schedule, there was no doubt that the master felt the ship was sufficiently prepared to undertake the passage to Southampton in the knowledge that safety training would continue during the voyage.

2.7.2 Malta administration and GL advice on readiness to sail

The Malta administration relied on its delegated surveyors to make the readiness-to-sail judgment. This was largely based on compliance with its FSI checklists, which were based on SOLAS and Malta administration requirements. Section 18 – *Additional Remarks/Comments/Deficiencies* – of the FSI conducted on 17 March 2012 stated:

> *"If class satisfied with the vessel's condition, vessel can sail for one voyage from Palermo to Southampton estimated on 6 days sea passage to finish with planned works".* [sic]

The ISM Audit conducted during 13 and 14 March at Palermo reported:

> *"…Also familiarisation and training has been carried out sufficient to ensure the ship's personnel can respond to emergency situations."*

and

> *"Suitable training and familiarisation with their equipment in all departments.has been given to the ship's complement prior to sailing."* [sic]

2.7.3 Summary

The FSI and GL survey reports both identified that the ship was ready for the passage. The master was in receipt of the necessary mandatory certification and, on the basis that the ship's safety management team had not raised any concerns about the level of safety training, the master's decision to sail was not unreasonable.

2.8 ONBOARD SAFETY MANAGEMENT ISSUES

2.8.1 General

The ISM Code provides the guiding principles for the establishment of ship-based safety organisations and their respective requirements. These were comprehensively set out in the SMS documentation, and it was largely the ship's SO who was accountable to the master for the implementation of those requirements.

Bringing a ship which is new to the company and her crew into service following an extensive refit can be extremely challenging. A well-led, organised and proactive ship safety management organisation is fundamental to preparing for the safe operation of the ship and her crew. In this case, there were a number of elements of the Safety Management Organisation missing that should have been in place at the time of the accident. Had they been, then the chances of the accident occurring might have been reduced.

The safety management training-related issues are dealt with at Section 2.6; other issues are discussed below.

2.8.2 Risk assessments

Comprehensive risk assessments and related control measures are fundamental to the safe operation of a ship. There were no generic or task-specific risk assessments carried out for any of the activities on board *Saga Sapphire* before the accident. The justification for this was that the supporting computer system had not been set-to-work and it was planned to commence task-specific risk assessments during the first cruise.

This key computer element should have been pursued by the refit project management team to ensure its availability during the latter stages of the refit. There was also the option of conducting paper risk assessments before passengers were embarked, but the safety management team were content to conduct high-risk activities, such as lifeboat drills, without assessing the risks.

Had assessments been conducted, it is possible that the risks relating to the operation of the lifeboats would have been identified. In particular, risks relating to accessing the slippery surfaces; effectiveness of the bowsing gear; working at height and shortcomings in the lifeboat preparation party and crew training could have been identified and control measures put in place.

2.8.3 Personal protective equipment

Despite the presence of officers, including, intermittently, the SO, while the starboard lifeboats were lowered in Palermo, none of the lifeboat crews wore a safety harness and tether to protect them from falling. The risk had not been identified, with the consequence that the control measure of wearing the correct PPE was not enforced, either in Palermo or at the time of the accident.

2.8.4 Safety harnesses

Review of the Safety Officer's Record Book showed that none of the PPE had been recorded or inspected. The nine safety harnesses held in the starboard deck store, the only ones available to the deck department, were manufactured in 1999 and so had long passed the 5 years life expectancy set by the manufacturer.

Had the out-of-date harnesses been used, and had a fall occurred, it is possible the harness might have failed under shock-loading, resulting in personal injury. This additional risk had not been recognised by the safety management organisation because of poor record-keeping.

2.9 FATIGUE

There is no evidence that any of the crew were suffering from fatigue and, therefore, it is not considered a contributing factor to this accident.

2.10 USE OF JACKLINES FITTED TO *SAGA RUBY*'S TENDERS

The identification of suitable safety harness tether anchor points, to satisfy work at height-related regulations, can sometimes be difficult. Careful consideration needs to be given to the most suitable location for the anchor points. Depending on the specific circumstances, it may be appropriate to connect the safety harness tether to part of the ship's structure or davit arm above the work site. In *Saga Sapphire's* case the safety tether was connected to the fall block, but on board *Saga Ruby* jacklines were used.

The jacklines fitted to the roofs of *Saga Ruby*'s tenders appear to be a reasonable option for the attachment of the tender/lifeboat crew's tethers. To protect against falls while on the coach roof during launching procedures. However, there is no evidence that this modification has been approved either by the tender/lifeboat manufacturer, Det Norske Veritas (the ship's classification society), or the Malta administration.

Despite the lack of formal approval for the system, the use of jacklines is well-recognised in the leisure industry and is used extensively on board yachts. While it is acknowledged that the webbing jackline had been load tested at manufacture, there is no evidence that the complete system – jackline, anchor bolts, shackles and shackle bolts have been subjected to a load test as a complete unit. In this application, the lifelines would have to provide for fall arrest, and not just full restraint as would be normal when the boat was afloat. The eyebolts, which have a small surface connection area, are fitted directly onto the GRP roof, and it is unclear what the arrangements are under the roof to dissipate the shock-loading in the case of a heavy person falling from the roof.

In addition, **Figure 22** shows that the jackstay has been contaminated by paint. It is well-recognised that solvents, which are present in paints, can severely affect the strength of natural rope and synthetic fibres, used in webbing rendering the system ineffective[8].

The jackstays provided for the fall arrest system fitted to *Saga Ruby*'s tenders should be subject to formal approval. In the meantime, there is a risk that the eyebolts may pull out of the coach roof, or the jackline may part because of paint contamination, when under shock-loading; the consequences of which could be severe.

[8] UK's Health and Safety Executive publication- 09/11-INDG367 - "Inspecting Fall Arrest Equipment Made from Webbing or Rope

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT WHICH HAVE RESULTED IN RECOMMENDATIONS

1. The first cook's lack of experience and inadequate understanding of his lifeboat crew duties resulted in him being unable to operate the forward bowsing gear and to release the tricing pennant safely when instructed to do so. [2.2], [2.6.5]

2. The method of securing the bowsing tackle rope to the bitts makes the rope vulnerable to slippage, resulting in slackening of the bowsing tackle if the operator is not in-line with the bitts to back up the tail of the rope. [2.3], [2.4.2]

3. The tender coach roofs and the open lifeboats' stem and stern compartment roofs, which were accessed by the lifeboat teams, were smooth and not finished with a non-skid application to prevent falling as required by LSA Code and Section 3.10 of MSN 1676(M). [2.4.1]

4. Requiring a single crewman to secure and hold the bowsing tackle rope and, at the same time, remove the drop-nosed pin securing the tricing pennant release lever, and then operate the tricing pennant release lever, risks overloading that person. [2.4.2]

5. Commercial pressure impacted on the ship's management team's focus on preparing the vessel for its operational role. [2.6.2]

6. The STO's reporting line by-passed the SO and, despite having the ship's overall training responsibility, there was no evidence that the onboard safety management team provided anything other than a superficial level of training oversight. [2.6.2]

7. There was no evidence that the need to allocate time for training requirements had been integrated into the refit project management plan. [2.6.3]

8. The quality and management of the lifeboat preparation training was below the standard necessary for the lifeboats to have been launched safely by the crew nominated on the muster/emergency plan. [2.6.4]

9. No one formally took control of delivering the lifeboat-related training despite the master advising the STO to consult with the SO, and the master instructing the SO to prioritise lifeboat training. [2.6.2], [2.6.4], [2.6.7]

10. Those involved in training management failed to identify the first cook's lack of experience and to ensure that he had received sufficient training for his lifeboat crew role. [2.6.5]

11. The ship's safety management organisation was weak and ill-prepared for its operational role in areas of management and oversight of training, risk assessments and control of PPE. [2.8.1], [2.8.2], [2.8.3], [2.8.4]

3.2 OTHER SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION ALSO LEADING TO RECOMMENDATIONS

1. The revised method of securing the bowsing tackle tail rope to the 'yellow bar' welded to the lifting plate is potentially unsafe. The bar is an undocumented modification, there is no evidence it has been subjected to a load test, and it may well be unfit for the purpose for which it is now being used. [2.4.3]

2. There is variation in the procedures promulgated on board for releasing the tricing pennants, which can cause confusion. Releasing the tricing pennants after the passengers have embarked in the lifeboat can lead to overload of the tricing pennant and equipment failure. There should be uniformity in the operating procedure instructions. [2.5.2]

3. Post-accident instruction promulgated by the ship's manager, requiring the Saga fleet to operate the bowsing tackle and tricing pennants from within the lifeboats, cannot be achieved safely in all cases. The instruction is confusing and should be re-issued with clarification in respect of the required operating procedure. [2.5.3]

4. The programmed training schedule for the "Lifeboat Preparation Teams" was intended to include the lifeboat crews but this was not made clear. It should be unambiguous that the training relates to both the preparation team and lifeboat crew. [2.6.6]

5. The Certificates Checklist, which identified training needs, did not include lifeboat preparation and crew training requirements. [2.6.6]

6. There is no evidence that the paint contaminated, webbing jacklines fitted to the roofs of *Saga Ruby*'s tenders to which the crew attach their safety harness tethers, have undergone any formal design consideration or load-testing. There is a risk that a shock-loading may cause the securing eyebolts or jackline to fail. [2.10]

3.3 SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION WHICH HAVE BEEN ADDRESSED OR HAVE NOT RESULTED IN RECOMMENDATIONS

1. Neither the fourth officer nor the first cook wore a safety harness and tether despite working at height. [2.2]

2. It was not possible, nor was it intended for a crew member standing inside a lifeboat, to operate the bowsing and tricing gear through the coach roof hatches. [2.4, 2.4.1]

3. The only satisfactory way of accessing the bowsing tackle and tricing pennant arrangements was by standing on the coach roofs of the tenders and on the stem and stern compartment roofs of the open lifeboats. [2.4.1]

4. Neither the Malta administration's FSI Reports, nor GL's Survey Statement identified the omission of non-skid surfaces from the tender coach roofs or the open lifeboat stem and stern compartment roofs. [2.4.1]

5. The use of the oversized bowsing tackle ropes identified in Palermo compromised safety because they jammed in the bowsing blocks and did not allow the rope to be properly secured to the bitts. Despite the master's instruction to change them, it was not fully implemented. [2.4.4]

6. The amount of refit work undertaken by contractors on the passage to Southampton and the refit-related work undertaken by the crew, both in Palermo and while at sea, impacted on the availability of the crew for training and the quality of the training. [2.6.2], [2.6.3], [2.6.4]

7. The delays in the refit completion date and the late delivery of the overweight lifeboats to the ship resulted in multiple changes to the muster/emergency plan, which had a negative effect on training continuity because of changing training needs. [2.6.3], [2.6.7]

SECTION 4 - ACTIONS TAKEN

Acromas Group has:

- Tasked the Acromas Shipping Ltd internal audit team to examine all aspects of the refit, in particular:
    - the effectiveness of the project management;
    - product quality;
    - increasing involvement of the ship's officers and crew;
    - consequences of the overweight lifeboats; and
    - delays to the refit completion date.

Acromas Shipping Ltd has:

- Appointed a Director of Risk to take a holistic view on company risk.
- Promulgated its internal accident report to the Saga fleet and instructed that the safety issues be discussed during safety meetings.
- Instructed vessels of the Saga fleet that:
    - Bowsing tackles and tricing pennants fitted to enclosed tender/lifeboats should only be operated from the coach roof.
    - Safety harnesses and tethers, and inflatable lifejackets are to be worn by lifeboat preparation crews.
- Amended Chapter 7 – Protection in Launching Areas – of the mv *Saga Sapphire*'s LSA Training Manual and Survival Techniques to include a new Section 7.4 covering the use of safety harnesses when preparing lifeboats **(Annex M)**.
- Replaced all bowsing tackle lines with 24mm polypropylene ropes.
- Endorsed the use of the "yellow" bar welded to the lifeboats' lifting plate as a back-up to securing the bowsing tackle tail rope to the block bitts[9]. The class surveyor has conducted limited non-destructive tests on the 'yellow bar' connection welds and is preparing a report on his observations.
- On 8 June 2012, replaced Nos 4 and 5 tenders on board *Saga Sapphire* with two, 130-person, Ernst Hatecke, Type PEL 9.7, partially enclosed lifeboats.
- Instigated a fleet-wide review of the SMS documentation to ensure, where instructions are ship-specific, it is current and appropriate to the individual vessel.
- Applied a non-slip surface to the relevant areas of *Saga Sapphire*'s tenders.

[9] The implications of this practice are discussed at Section 2.4.3

SECTION 5 - RECOMMENDATIONS

Acromas Shipping Limited is recommended to:

2012/146 Seek formal approval from the Malta administration and the appropriate classification society in respect to:

- The use of the welded bar modification, fitted to the tender lifting plates, as means of securing the bowsing tackle rope.
- The use of the jackline safety harness tether, securing arrangements currently in use on *Saga Ruby*'s tenders.

2012/147 Review the operating instructions for the bowsing and tricing arrangements fitted as part of the launching system for all tenders and lifeboats across the Saga fleet, to ensure they are consistent and accord with best practice.

2012/148 Review the following project management and ship-related procedures for bringing a vessel into service:

- Integration of the key training requirements into the project management plan, in particular for training that is equipment-dependent.
- Timely establishment of the ship's safety management organisation with respect to risk assessments, recording and, where appropriate, tests/inspection of personal protective equipment.
- Management, reporting lines and communication arrangements for training during non-operational (refit/docking), transitional and operational phases to ensure that:
    - All crew receive training appropriate to their tasks.
    - An effective and consistent level of training oversight is maintained.

Marine Accident Investigation Branch
November 2012

Safety recommendations shall in no case create a presumption of blame or liability